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Cost and Revenues in the Gulf of Mexico Shrimp Fishery

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Notice

Abstract

While cost and revenue data is not routinely collected in the southeastern region of the United States, many speicalized data collection efforts have been funded by Sea Grant, Saltonstall/Kennedy grants, and Marine Fisheries Initiative cooperative agreements to collect data concerning the financial viability of the shrimp fishery in the Gulf of Mexico. This study describes new data collection efforts in the Gulf of Mexico and presents a statistical analysis of a data set that combines the authors of existing studies. The statistical analysis suggests that home port and hull construction material do not directly affect the total costs of operating in the shrimp fishery. The resulting statistical model allows the estimation of total operating costs for vessels operationg in the Gulf of Mexico shrimp fishery so that the impacts proposed fishery management regulations can be determined by cost-benefit analysis.

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Introduction

Cost and revenue information is necessary to determine both the direction and magnitude of change in net benefits for fisheries that are subject to fishery management regulations. Without this critical information, the change in fishing effort induced by the adoption of a proposed fishery management regulation cannot be determined. As a result, costs and benefits of a proposed regulation cannot be estimated. Even if regulations are adopted prior to developing net benefit estimates, the lack of accurate cost and revenue information prevents the assessment of the regulation's impacts. In highly variable fisheries, such as shrimp, this is especially true. The impacts of regulations designed to improve the financial viability of the fleet or reduce pressures on the stocks cannot be separated from naturally occurring variations in stock abundance or from financial conditions that are beyond the control of individual fishermen.

Unfortunately, the routine collection of cost and revenue data is not conducted for fisheries in the southeastern region. Specialized data collection efforts are undertaken on an individual fishery basis at different points in time (Appendix C). Not only is data collected for different fisheries incompatible, but data collected for a given fishery is often not comparable because no common denominator exists between the surveys. Usually mean estimates are provided to summarize data collected in different studies and the original data is not available for future analyses.

This study is designed to address the compatibility problem of cost and revenue survey results. Newly collected cost and revenue data for shrimp vessels are combined with data from earlier studies. This report presents the cost and revenue data collected under contract (Resource Economics Consultants, 1994) and compares the financial performance of different aspects of the fleet based on vessel characteristics such as hull construction material, vessel length, and reported home state over time. The resulting data set is used to estimate a set of equations from which operating costs for individual vessels in the shrimp fishery can be estimated (Appendix B).

The next section of this report presents a review of some of the published studies of shrimp vessel operating costs and revenues. This is followed by a description of the data set collected under contract by Resource Economics Consultants. The data for the entire Gulf of Mexico is summarized in the next section. Following this, the data collected from Texas for 1987 to 1992 is compared to the historical Texas data (Appendix A) since the offshore Texas fishing fleet is a major component of the Gulf of Mexico shrimp fishery. A discussion of trends and a comparison of different vessel operations with caveats is presented next. A statistical analysis to determine if hull construction material, vessel length, and home state are important determinates of operating costs is developed. The paper concludes with a summary of the important results. An annotated bibliography of cost and returns analyses is provided in Appendix C.

Review of Existing Studies

Since cost and revenue data for southeastern region fisheries are not routinely collected, many specialized data collection efforts have been undertaken. Generally, specific analyses of different market levels or areas of operation are conducted. However, differences underlying each cost and revenue survey prevent direct comparisons of their results. The magnitude of these differences can be seen in the range of reported descriptive statistics. For example, mean total revenue for surveyed vessels has been reported as $60,142 (Warren and Griffin, 1978) and $9,214 (Duffy and Johnson, 1979). In addition, the sample sizes of the surveys range from 1 (Anonymous, 1977) to 115 vessels (Griffin and Nichols, 1976). Vessel characteristics also vary between reports. Vessel length range from less than 24 feet (Duffy and Johnson, 1979) to greater than 70 feet (Griffin, Lacewell, and Hayenga, 1974). Both the definition and the number of size classes differ between reports. Blomo and Griffin (1978) report two size classes of vessels (28 to 55 feet and 56 to 80 feet) while Arnold (undated) uses nine vessel size classes. Vessels operate out of Texas (Swartz and Adams, 1979), Louisiana (Roberts and Sass, 1979), and Florida (Blomo and Griffin, 1978). The surveys concentrate on different areas of operation and different years are studied. Duffy and Johnson (1979) studied the inshore Louisiana shrimp fishery. Arnold (undated) studied the Tortugas pink shrimp fishery exclusively. Blomo and Griffin (1978) did not distinguish costs and revenues by area of operation off Florida.

The previously cited studies collect and analyze annual operating costs and revenues for shrimp fishing operations in the Gulf of Mexico. Waters and Nance (1990) have conducted a unique study of the inshore and bait shrimp fishery of Galveston Bay, Texas during 1987. Their study collected variable cost information for individual trips taken by vessels in the brown and white shrimp fisheries. The premise of the study is that once the decision to make a shrimp fishing trip is made, trips continue until the marginal revenue from the last trip is less than or equal to the marginal cost of making that trip. Since individual trip data is collected in this study without unique vessel identifiers, annual estimates of costs and returns could not be estimated using data from alternative sources.[1] Without vessel identifiers, vessels that are sampled more than once may bias survey results.[2]

As a result, comparisons of these studies do not provide any information on long term trends in costs relative to revenues in the shrimp fishery. As an example, consider the comparison of 66 to 72 foot vessels operating off the coast of Texas (Griffin, Lacewell, and Hayenga, 1974) with vessels 24 feet or less in length operating in the bays and rivers of Louisiana (Duffy and Johnson, 1977) or with a 36 foot vessel making a single trip in Galveston Bay (Waters and Nance, 1990). Although each study reports costs and revenues for shrimp vessels, meaningful conclusions cannot be drawn about the long term trends in the fishery because no common denominator exists between the reports.

Ward (1988) hypothesized that cost and revenue trends are implicitly contained in the published survey data. Changes in the cost and revenue structure of the firm from, for example, the utilization of a new production technology would have been implicitly represented in the published survey results for that point in time. If these changes are assumed to affect the structure of all firms similarly, then these trends can be used as the common denominator to estimate costs and revenues based on historical data, to interpolate missing values, and extrapolate future values. Annual fleet level estimates of costs and revenues are calculated for three vessel size classes operating in the offshore waters of Texas, Louisiana, and Florida from 1971 to 1980. While the lagged values of a relative operating cost index constructed from the estimated data are correlated with annual shrimp vessel fleet size ($r=-0.46$), impacts of proposed management regulations could not be determined from the estimated equations.

To correct this shortcoming, data collected in 1983 for the 1982 fishing year in the southeastern region of the United States (Danvill Research Associates, 1982) is used to develop an indirect cost model for a vessel in the shrimp fishery (Ward and Sutinen, 1992). This indirect cost model is used to develop estimates of vessel operating costs and net revenue time trends in the Gulf of Mexico shrimp fishery (Ward and Nance, 1994) from 1965 to 1991. With operating cost estimates for individual vessels, the impacts of proposed fishery management regulations for the shrimp fishery

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[1]The National Marine Fisheries Service maintains the shrimp landings file from which a record of individual trips by vessel identifier could be generated. This information combined with the cost per trip data collected in this study could be used to estimate annual costs and returns for bay and bait shrimp fishery vessels.

[2]"special statistical techniques are required for vessels that are sampled more than once" Waters and Nance (1990), page 33.

can be determined. However, cost and revenue survey data has not been collected since 1982 that would allow this model to be updated.

Description of the Data Set

This survey is designed to collect cost and revenue data from a region in the Gulf of Mexico. This data set is then used to estimate, calibrate, and validate a model that estimates cost and revenue data for the entire Gulf of Mexico shrimp fishery. The potential shrimp vessel universe consisted of 2,600 vessels with an estimated sample of 100 vessels being a valid sample size.[3]

Dockside interviews were chosen as the data collection method based on prior experience with approximately 15 other surveys that have successfully developed vessel income statements. A representative sampling approach using both strata and local random sampling was used to insure the representativeness of the sample. The primary targeted year for the cost and revenue data was 1992. However, for some vessels it was possible to collect costs and revenue data back to 1987. A total of 524 vessels were selected as potential candidates for interviewing their owner or captain. A total of 415 interviews were completed from this list of initial contacts. Table 1 presents by designated study port the number of contacts, non-responses, and usable responses per year. Table 2 lists the variable names and provides a definition for the variables in the data set.

In addition to the collected data, historical cost and returns data were incorporated into this data set. Seven survey data sets collected in studies of various regions within the Gulf of Mexico were provided by the principle investigators.[4] A combined data set with 2,258 observations covering the 1969 to 1992 time period resulted from this collaboration.

The Shrimp Fishery of the Gulf Of Mexico

Mean costs and revenues for all surveyed vessels that operated in the Gulf of Mexico shrimp fishery between 1969 and 1992 are presented in Tables 3 to 16 after converting actual dollar values to a 1977 base year. Total revenue, net revenue, total operating

[3]This sample size was based on survey sampling formulas that lead to a 95% bound on the error of the estimate.

[4]Data sets from previous cost and returns studies were provided by Joy Clark of Alabama State University, Teo Ozuna and Wade Griffin of Texas A&M University, Walter Keithly and Ken Roberts of Louisiana State University, John Ward of the Southeast Regional Office of the National Marine Fisheries Service, and Gary Brown of the consulting firm Kearny-Centaur.

costs, and costs by subcategory such as supplies, crew shares, and maintenance and repairs are estimated by designated home state, by vessel size category, and hull construction type. The mean value plus and minus one standard deviation is presented to provide an indication of the range of values in the data set. Following these tables, an annual time series of total revenue and total cost (Figure 1) and net revenue (Figure 2) is presented for surveys conducted between 1969 and 1992.

Overall, mean net revenue earned by fishing firms is $6,564 (Table 3). The major cost items are fuel ($8,107), maintenance ($7,861), and insurance ($7,110). The plus and minus one standard deviation from the mean columns indicate that both firms earning higher and lower total revenues report lower net revenues ($4,181 and $2,249, respectively) than did the average firm.

<u>Vessel Size Class</u>

Tables 4, 5, and 6 present the mean cost and revenue data for vessels operating in the Gulf of Mexico shrimp fishery by vessel size class. The small, medium, and large vessel size classes of less than 25 feet, 25 to 50 feet, and greater than 50 feet in length, respectively, conform to those most often cited in the literature (Ward, 1988). While mean total cost increases as firms increase in size, the composition of total operating cost changes. Fuel cost, for example, increases from $370 for small vessels to $1,851 for medium vessels to $20,316 for large vessels. However, as a percent of total cost, fuel costs decline as vessels increase in size. Fuel costs are 31.3% of total cost for small vessels, 23% of total cost for medium vessels, and 20.6% of total cost for large vessels. Crew shares, however, increase in both absolute and percentage terms. As a percentage of total operating cost, crew shares are 0.2% for small vessels, 1.3% for medium vessels, and 29.8% for large vessels.

Tables 4, 5, and 6 also indicate that mean total revenue increases with vessel size. In addition, the share of total revenue that the crew receives increases with the size of the vessel. Crew share is 0.12% for small vessels, 0.88% for medium sized vessels, and 28.5% for large vessels. The importance of other sources of revenue to fishing firms declines with vessel size. Other revenue is 18.85% of total revenue for small vessels, 15.67% for medium size vessels, and 2.93% for large vessels. This result implies that firms become more specialized in the production of shrimp as vessel size increases.

The small vessel size class has the lowest reported mean net revenues ($829). Medium and large vessels have net revenues of $4,119 and $4,382, respectively. Given the range in the reported plus and minus one standard deviation values, the reported mean net revenues are probably not significantly different. However, the reported differences in mean total cost and revenue for the medium and large size vessels probably are significantly different based on the range in their standard deviation values.

Home State

Tables 7 to 11 present fishing firm cost and revenue by reported home state of the operator or owner of the vessel. Firms operating out of Florida ports report the highest mean net revenue ($15,434) followed by Mississippi ($7,190), Texas ($5,934), Alabama ($2,472), and Louisiana ($1,704). In Florida, Alabama, and Mississippi, the mean plus one standard deviation indicates that many fishing firms are reporting losses from operating in the shrimp fishery. Louisiana and Texas firms are reporting profitable operations plus and minus one standard deviation from the mean.

While Texas ranks third in terms of mean net revenue generated by firms in the Gulf of Mexico shrimp fishery, it is first in terms of mean total cost and revenue. Texas is followed by firms operating out of Alabama, Florida, Mississippi, and Louisiana. Other revenue is 1% of total revenue for Texas, 9.5% for Alabama, and 16% for Mississippi. Florida and Louisiana did not report other revenue as a source of income.

Mean crew share as a percent of mean total revenue is highest in Alabama (60.1%), followed by Florida (51.8%), Mississippi (32.3%), Texas (27.7%), and Louisiana (0.28%). These results probably reflect differences in the scales of operation in each reported home state. Texas which is characterized as having a predominately large vessel, offshore fleet, with two or three crew members as well as a captain would tend to report higher crew shares than Louisiana which has been characterized as a small boat, inshore fishery with one or no crew members working with the captain. This behavior is also seen in other operating cost categories. For example, fuel cost in Texas ($19,501) is 2,229% of the reported fuel cost in Louisiana ($875) and insurance in Texas is 384% of insurance in Louisiana.

Hull Construction Material

The five reported types of hull construction material are used to create cost and revenue profiles for aluminum (Table 12), fiberglass (Table 13), reinforced fiberglass (Table 14), steel (Table 15), and wood (Table 16) vessels. Hull construction material is most likely to affect the costs of maintenance, depreciation, and insurance. Steel hulls have the highest maintenance costs ($20,562), followed by fiberglass ($18,399), wood ($12,578), reinforced fiberglass ($11,859), and aluminum ($550). Much of these differences in maintenance costs are probably due to other factors such as the size of the vessel. For example, vessels with wood hulls are common throughout all vessel size classes (a mean of 65 feet with an one standard deviation range of 50 to 84 feet) while aluminum hulls are predominately smaller size class vessels (21 foot mean length with a 19 to 23 foot one standard deviation range) and steel hulls are predominately larger size class vessels (72 foot mean length with an one standard deviation range of 67 to 78 feet).

Depreciation and insurance costs have similar patterns. Fiberglass hulls report the highest annual depreciation ($12,248) followed by steel ($7,979), wood ($3,675), and aluminum hulls ($405).[5] Insurance payments are highest for fiberglass hulls ($11,596) followed by steel ($8,179), wood ($6,230), reinforced fiberglass ($3,857), and aluminum hulls ($657). Given the values for the one standard deviation range about the mean, it is unlikely that the steel and fiberglass hull depreciation and insurance rates are significantly different.

Two factors that affect the level of reported depreciation and insurance are the value of the vessel at the time it is purchased and the age of the vessel. Excluding aluminum hulls, wood hulls are the oldest age vessel (mean of 21 years) and have the lowest initial cost ($86.5 thousand). The most expensive vessels in terms of their initial costs are those with fiberglass hulls; $204 thousand. They are also the youngest vessels with a mean age of 14.4 years. Aluminum hulled vessels are the youngest averaging 12 years in age and the lowest initial cost ($12.3 thousand).

Net revenue is negative for firms using aluminum hulls (Table 12) and reinforced fiberglass hulls (Table 14). Positive net revenue is reported for fiberglass (Table 13), steel (Table 15), and wood hulls (Table 16). Only steel hulls report positive net revenues across the plus and minus one standard deviation range. Fishing firms using other hull types are less likely to report profitable operations.

<u>Time Trends</u>

In addition to presenting information about the mean values of total revenue, operating costs, and net revenue for various classes of fishing firms in the Gulf of Mexico shrimp fishery, the trend over time in reported total revenue, total cost, and net revenue can be presented. Figure 1 presents average total revenue and total operating cost and Figure 2 presents average net revenue for the 1969 to 1992 time period.

These figures indicate that 1973, 1974, 1979, and 1987 to 1992 are years in which total operating costs exceed total revenue or net revenue is negative. The years 1972, 1976, and 1986 are above average years in terms of net revenue in the Gulf of Mexico shrimp

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[5]Reinforce fiberglass hulls did not report depreciation.

fishery. While eight years report negative net revenues, 16 years have positive net revenues with 3 of those years reporting above average net revenues for the fishery.

The Texas Shrimp Fishery

Resource Economics Consultants (1994) collected cost and revenue data from vessels operating in the Texas shrimp fishery between 1987 and 1992 (Table 1). Total revenue, net revenue, and total costs are summarized in Tables 17 to 24 for the Texas data set, by vessel size category, and hull construction type. The mean plus and minus one standard deviation provide an indication of the range of values in the data set. An annual time series of total revenue and total cost (Figure 3) and net revenue (Figure 4) is presented for the data collected between 1987 and 1992. The information for the Texas shrimp fishery is compared to the summarized data for the entire Gulf of Mexico shrimp fishery and to the historical data collected for the Texas fishery in Appendix A.

For fishing firms operating out of Texas ports (Table 17), mean total revenue for 1987 to 1992 is higher than the 24 year mean reported in Table 3 for the entire Gulf of Mexico shrimp fishery, and in Table 11 for the Texas shrimp fishery. Total costs reported in Table 17 are also higher than the mean values reported in Tables 3 and 11 resulting in negative net revenues for the 1987 to 1992 time period. The one standard deviation range around the mean value in Table 17 indicates that most Texas fishing firms (68% of those sampled) reported losses during this time period. Mean net revenue in Table 17 is negative in spite of a 13% decline in crew share relative to that in Table 11 even though mean total revenue is 1% higher from 1987 to 1992 than for 1969 to 1992. The major cost increases are for insurance (50%) and for maintenance (34%). Fuel costs actually declined relative to the 24 year average in Table 11.

<u>Vessel Size Class</u>

Tables 18, 19, and 20 present the average costs and revenues for small, medium, and large vessels. For the 1987 to 1992 time period, mean net revenue is negative. Losses increase from $1,505 for small craft (Table 18) to over $10,000 for large craft (Table 20). Only medium size craft plus one standard deviation from the mean value report positive net revenues (Table 19). By comparison, mean net revenue between 1969 and 1992 is positive for Texas fishing firms in Tables A1, A2, and A3 in Appendix A. Crew share as a percent of total revenue declines 4.5% for small firms, increases 1.5% for medium firms, and declines 3.5% for large firms in a comparison of the 24 years of data in Tables A1 to A3 to the 6 years summarized in Tables 18 to 20.

Increases in insurance cost probably are the main cause of the reported negative mean net revenues for large vessels. Large vessels experienced a 112% increase in mean insurance cost in Table 20 relative to Table A3. The increase in insurance costs for large vessels appears to have had a significant impact on the Texas shrimp fishing fleet.

Hull Construction Material

Vessels using fiberglass hulls report losses of $11,958 on average between 1987 and 1992 (Table 22). Losses for steel vessels were $9,427 in Table 23, $7,484 for wood vessels (Table 24), and $1,018 for aluminum vessels (Table 21).[6] These losses represent substantial declines in net revenue for fishing firms operating out of Texas ports according to the historic data in Tables A4 to A7. Steel vessels, which report the highest net revenue (Table A6), have suffered a 246% decline in mean net revenue. Wood vessels have experienced a 324% decline in net revenue in a comparison of Tables A7 and 24. The major cost category that affected net revenues is insurance. Insurance cost for steel vessels in Table 23 has increased 95% from the mean value for 1969 to 1992. Similarly, wood vessel insurance costs have increased 91 percent. Maintenance costs are a significant cost factor for steel vessels increasing 68% between Table A6 and Table 23.

Time Trends

The survey data for 1987 to 1992 indicates that the shrimp fishery off the coast of Texas has been financially stressed. Mean total cost always exceed mean total revenue in Figure 3. Figure 4 indicates that firms operating out of Texas ports between 1987 and 1992 consistently generate negative net revenues. Six years of negative net revenue on average should have had a significant negative impact on the size of the shrimp fleet in Texas waters.

Discussion

Table 3 and Figures 1 and 2 indicate that the Gulf of Mexico shrimp fishery has generally been profitable for firms engaged in harvesting shrimp. Fishing firms using medium and large vessels generate the highest net revenue (Tables 4, 5, and 6) while firms using craft in excess of 50 feet in length generate the highest level of total revenue. Tables 7 to 11 indicate that firms operating out of Florida report the highest net revenues while Texas firms report the highest level of total revenue. Wood hull vessels (Table 16) have the highest reported net revenue of all hull construction materials with steel hull vessels (Table 15) a

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[6]Vessels with aluminum hulls entered the Texas shrimp fishery after 1986 and are not included in the historical data presented in Tables A4 to A7. Also, vessels with reinforced fiberglass hulls were not reported to have operated in the Texas shrimp fishery after 1986 and are not included in the Tables 21 to 24.

close second. Steel hulled vessels are the only category that report positive net revenues within a plus and minus one standard deviation range of the mean. As a result, the tables imply that large, steel hulled fishing craft with a home state of Florida are the most likely firms to have a profitable shrimp fishing operation.

Over the 1969 to 1992 time period, the Texas shrimp fishery has reported positive net revenues on average (Table 11). In more recent years, the financial viability of the Texas shrimp fishery has not been as strong (Table 17). In nearly all categories, negative net revenues have been reported. The most likely cause of these declines in fleet financial viability is the increase in insurance cost that occurred between 1987 and 1992. For steel hulled vessels, maintenance cost increases are a significant factor in reducing net revenues. Since the Texas shrimp fishery is characterized by large, steel hulled vessels that operate in the Exclusive Economic Zone, substantial increases in maintenance costs would have a significant impact on the financial viability of the Texas fleet.

Great care should be taken in applying these descriptive statistics to the actual financial viability of the Gulf of Mexico and Texas shrimp fisheries. The data set collected is based on individual data collection efforts that, while perfectly suited to analyzing a particular problem, may not reflect a random sample of the entire Gulf of Mexico shrimp fishery when analyzed collectively. For example, Ward and Nance (1994) report net revenue trends from 1966 to 1990 for the shrimp fishery based on total revenue reported by the fishing fleet and operating costs estimated by an indirect cost model. The annual trend in mean net revenue in that report declines over time, but remains positive. However, this trend in net revenue is an average for vessels operating in the Gulf of Mexico. The indirect cost model should be modified to estimate the net revenue trend for the vessels operating out of Texas ports after incorporating the reported increases in insurance and maintenance costs before making comparisons.

Statistical Analysis

To account for these shortcomings, a simultaneous 3 equation model of vessel operating costs is estimated by three stage least squares using 1,477 vessel observations for the Gulf of Mexico shrimp fishery. Table 25[7] presents the estimated parameters for the total cost, crew share, and shrimp landings equations. The resulting model explains 74 percent of the variation in the observed data.

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[7]Appendix B contains a complete set of statistical results for the econometric model.

The model is used to test the hypotheses that home state (Tables 7 to 11), vessel length (Tables 4 to 6), and hull construction type (Tables 12 to 16) are significant components of vessel operating costs. Length, entered as a continuous variable in the total cost equation in Table 25, is statistically significant. The total costs of operating the vessel increases as vessel length increases. Qualitative variables representing home state and hull construction type are statistically insignificant in the total cost and the pounds landed equations. The qualitative variable for aluminum hull construction type and home state of Alabama are statistically significant in the crew shares equation. The null hypotheses that home port and hull construction type do not directly affect total operating costs can not be rejected.

Of the remaining variables, total costs increase with pounds landed, fuel price, and crew share. Total cost declines as the age of the vessel and the abundance of shrimp. As shrimp abundance increases, catch per unit effort should increase, cost per pound landed should decline, and total cost should decrease. The total operating cost equation behaves as theory would predict.

The pounds landed equation in Table 25 indicates that shrimp landings are positively related to shrimp price, crew share, and days at sea and negatively related to cost per pound landed, abundance of shrimp, and age. The shrimp price variable is retained in the system of equations as an explanatory variable even though it is statistically insignificant because it is a theoretically important variable and has the correct sign according to economic theory. Pounds landed is expected to be positively related to abundance. The negative coefficient indicates that as abundance increases, pounds landed declines. This may be due to a work-leisure trade off with fishermen working less as catch per unit effort increases (Buss, 1994) or a vessel crowding externality may exist in the fishery (Ward and Sutinen, 1994).

The crew share equation in Table 25 is expected to be positively related to shrimp price and pounds landed, and negatively related to fuel price. However, the pounds landed variable is statistically insignificant and has been dropped from the crew share equation. Fuel price is expected to have a negative relationship with crew share since fuel costs are often deducted from total revenue before the crew share is calculated. Similarly, the supplies per day at sea variable is expected to have a negative sign. The positive sign on this variable with high statistically significance implies that supplies are not deducted from total revenue when crew shares are calculated. Vessels with aluminum hulls have lower crew shares and vessels with a home state of Alabama have higher crew shares. This is the only equation in which any of the qualitative variables have statistical significance. This suggests that vessels of similar operational scale from any home state have similar operating costs. The perceived differences are actually due to variation in the physical characteristics of the vessels operating out of those states.

Conclusions

The intent of this analysis is to provide a descriptive analysis of cost and revenue data collected under a contract by Resource Economics Consultants. Historical cost and revenue data and data collected in 1992 have been combined to develop mean total revenue, total cost, and net revenue estimates for vessels operating in the Gulf of Mexico shrimp fishery. The tables and figures in this report indicate that on average, fishing firms have been profitable over the 24 year time period of available data. However, the data set collected by Resource Economics Consultants for vessels with a designated home state of Texas indicates that vessels have generated negative net revenues over the 6 year time period of 1987 to 1992 probably the result of increasing insurance and maintenance costs.

A statistical analysis has been conducted to determine if the descriptive vessel characteristics of vessel length, hull construction type, and home state have a statistically significant impact on total operating costs (Table 25). Only length of the vessel has a statistically significant impact on total cost. Qualitative variables representing a home state of Alabama and an aluminum hull construction type are statistically significant in the crew share equation. Since qualitative variables for home state are not statistically significant in the estimated total cost equation, it is likely that all large vessels operating offshore in the Gulf of Mexico shrimp fishery may be suffering financial distress similar to that found for Texas during the 1987 to 1992 time period. However, before this generalization can be accepted, an analysis of annual shrimp landings for individual vessels needs to be completed.

Finally, the statistical analysis indicates that theoretically valid estimates of total operating costs can be estimated using the combined data sets. While additional data analysis may be required, the results in Table 25 and Appendix B indicate that total cost estimates are available for use in developing models that explain changes in fishing effort caused by various proposed management regulations. Net benefits of proposed fishery management regulations can now be developed for the Gulf of Mexico shrimp fishery.

For example, a proposed regulation to adopt a bycatch reduction device in the shrimp fishery would affect the intercept terms of the total cost and pounds landed equations in Table 25. The intercept term in the total cost equation represents fixed costs and would increase to reflect the costs of purchasing and maintaining the device. The intercept term in the pounds landed equation is theoretically equivalent to the catchability coefficient of the gear and would be reduced to reflect the loss in shrimp production expected by the adoption of the device. If the effect on gear catchability is greater than the fixed cost effect, then the estimated total cost for the average vessel would decrease, rents would be generated, and effort would increase in the shrimp fishery. The point of this example is that the impacts of a proposed management regulation can be determined independent of all other outside effects such as increases in imports of shrimp or changes in consumer income that would affect shrimp price levels, changes in the price of fuel, or natural variation in abundance. These outside effects could be held constant in this statistical model of the shrimp fishery.

Table 1

Summary of Contacts and the Number of Respondents

Port	Initial Contacts	Non-Response	Usable Responses Per Year 1992	1991	1990	1989	1988	1987
Brownsville	93	30	19	12	11	11	5	5
Fulton	46	1	6	8	8	8	7	8
Port Isabel	231	11	46	43	40	40	28	23
Aransas Pass	97	37	10	10	10	10	10	10
Palacios	33	16	17	0	0	0	0	0
Freeport	17	7	10	0	0	0	0	0
Port Arthur	7	7	0	0	0	0	0	0
TOTAL	524	109	108	73	69	69	50	46

Table 2

Alphabetic List of Variables and Definitions

Variable	Definition
ABUNTDOL	Dollars Per Day Fished
ABUNTLBS	Catch Per Day Fished
CONS	Construction Material[8]
CREWPCNT	Percent Crew Revenue
DAYS	The Number of Days at Sea
DEPREC	Depreciation
DFPT	Days Fished Per Trip
FOOD	Food Cost
FUELCOST	Fuel Cost
GALFUEL	Gallons of fuel used
HOMESTAT	Home State
INITCOST	Initial Cost of the Vessel
INSUR	Insurance Cost
INTEREST	Interest Paid
LBSPT	Pounds Per Trip
LENGTH	Length of the Vessel
MAINT	Maintenance Cost
MGMTFEE	Management Fee
MKTVALUE	Market Value of the Vessel
OTHCREW	Number of Crew for Other Fishery
OTHLBS	Number of Pounds of Other Fish
OTHREV	Revenue From Other Sources
OVERHEAD	Overhead
SHARES	Crew Share
SHRLBS	Crew Share in Pounds of Shrimp
SHRREV	Crew Revenue
SOURCE	Source of Survey Data
SUPPLY	Cost of Supplies
TRIPS	Number of Trips
YEAR	Year of Data
YRBUILT	Year Vessel Built
YR_PUR	Year Vessel Purchased

[8]Steel, wood, fiberglass, reinforced fiberglass, or aluminum.

TABLE 3
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	42864.83	220210.44	8343.81
Other Revenue	1933.73	10765.37	347.35
Total Revenue	43001.86	220412.33	8389.55
Fuel Cost	8106.57	43188.36	1521.62
Supplies	3811.64	23353.95	622.10
Maintenance	7860.61	53523.07	1154.44
Overhead	1498.82	8036.47	279.53
Interest	5007.91	19802.05	1266.49
Depreciation	2024.83	12337.96	332.30
Insurance	7110.18	15072.51	3354.10
Total Overhead	3297.91	26427.23	411.55
Crew Shares	3536.57	199094.60	62.82
Total Cost	36437.71	216231.16	6140.22
Net Revenue	6564.15	4181.18	2249.33

1977 Base Year

TABLE 4
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Vessel Length Class : Less Than 25 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	2008.42	6199.34	650.67
Other Revenue	379.27	1788.09	80.45
Total Revenue	2011.57	6216.26	650.94
Fuel Cost	370.22	1032.49	132.75
Supplies	143.98	438.73	47.25
Maintenance	143.03	601.36	34.02
Overhead	139.37	239.23	81.20
Interest	334.31	995.83	112.23
Depreciation	402.41	1338.41	120.99
Insurance	434.06	1485.30	126.85
Total Overhead	301.51	859.09	105.82
Crew Shares	2.44	26.20	0.23
Total Cost	1182.64	2939.60	475.79
Net Revenue	828.93	3276.65	175.15

1977 Base Year

TABLE 5
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Vessel Length Class : Between 25 and 50 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	11924.62	32064.43	4434.71
Other Revenue	1906.04	12912.34	281.36
Total Revenue	12160.52	32716.69	4519.97
Fuel Cost	1851.02	4298.08	797.17
Supplies	989.84	2596.35	377.37
Maintenance	1775.65	5563.77	566.69
Overhead	278.44	686.69	112.90
Interest	1032.54	3276.68	325.37
Depreciation	1623.56	4292.47	614.08
Insurance	1788.92	6005.95	532.85
Total Overhead	432.87	4649.46	40.30
Crew Shares	106.99	6026.38	1.90
Total Cost	8041.35	18230.06	3547.07
Net Revenue	4119.17	14486.62	972.90

1977 Base Year

TABLE 6
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Vessel Length Class : Greater Than 50 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	102839.08	162666.74	65015.61
Other Revenue	3015.99	6458.39	1408.43
Total Revenue	102873.81	162586.15	65091.77
Fuel Cost	20316.86	32448.28	12721.01
Supplies	9838.62	21025.15	4603.94
Maintenance	18676.62	43287.17	8058.18
Overhead	3885.74	10128.03	1490.81
Interest	6577.51	20987.10	2061.44
Depreciation	7505.12	29927.60	1882.10
Insurance	7611.82	14112.49	4105.57
Total Overhead	7846.88	33373.45	1844.99
Crew Shares	29315.56	70410.71	12205.56
Total Cost	98491.62	151598.05	63988.95
Net Revenue	4382.19	10988.10	1102.83

1977 Base Year

TABLE 7
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Home State : Alabama

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	58223.61	236974.44	14305.29
Other Revenue[9]	-	-	-
Total Revenue	58264.63	237289.40	14306.44
Fuel Cost	7030.44	61501.02	803.68
Supplies	3939.37	17051.22	910.12
Maintenance	15723.32	77475.41	3190.99
Overhead	1894.29	12179.84	294.61
Interest	12527.16	36635.40	4283.55
Depreciation	16190.91	61781.02	4243.14
Insurance	8113.96	18384.01	3581.17
Total Overhead	3185.36	76158.73	133.23
Crew Shares	35008.32	110382.47	11103.06
Total Cost	55792.99	303433.03	10258.80
Net Revenue	2471.64	-66143.63	4047.65

1977 Base Year

[9]Only one firm reported revenue from some other source of $5,517.24 in Alabama. If fewer than five firms reported, the category was deleted.

TABLE 8
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Home State : Florida

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	55047.37	186328.77	16262.72
Other Revenue	0.00	0.00	0.00
Total Revenue	55047.37	186328.77	16262.72
Fuel Cost	9639.97	30907.05	3006.73
Supplies	2442.67	8214.87	726.32
Maintenance	14256.96	72763.65	2793.44
Overhead	124.49	226.78	68.33
Interest	19658.15	35160.91	10990.69
Depreciation	14541.64	58963.40	3586.28
Insurance	8320.34	20363.83	3399.56
Total Overhead	1633.37	49477.07	53.92
Crew Shares	28516.46	138944.04	5852.63
Total Cost	39613.46	210080.48	7469.64
Net Revenue	15433.90	-23751.71	8793.07

1977 Base Year

TABLE 9
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Home State : Louisiana

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	4842.00	22395.03	1046.88
Other Revenue[10]	-	-	-
Total Revenue	4843.21	22410.95	1046.66
Fuel Cost	875.39	3673.37	208.61
Supplies	367.10	1727.07	78.03
Maintenance	597.41	4802.22	74.32
Overhead	196.99	439.07	88.38
Interest	1699.62	10378.74	278.33
Depreciation	810.10	3528.39	186.00
Insurance	1951.75	8532.71	446.44
Total Overhead	611.06	2075.20	179.93
Crew Shares	13.65	692.09	0.27
Total Cost	3139.46	14752.67	668.10
Net Revenue	1703.75	7658.28	378.56

1977 Base Year

[10]Two fishing firms reported revenue from other sources as $5,862.07 out of 565 observations in Louisiana. If fewer than five firms reported, the category was deleted.

TABLE 10
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Home State : Mississippi

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	23696.75	71368.84	7868.08
Other Revenue	4186.41	15312.39	1144.56
Total Revenue	26189.00	73229.14	9366.00
Fuel Cost	3828.00	13561.65	1080.51
Supplies	1302.61	4634.44	366.13
Maintenance	6031.57	27363.73	1329.49
Overhead	391.11	2671.94	57.25
Interest	2250.91	14535.46	348.57
Depreciation	13673.25	51050.84	3662.19
Insurance	9233.10	17434.02	4889.88
Total Overhead	360.79	11420.01	11.40
Crew Shares	8451.41	27818.19	2567.62
Total Cost	18998.61	85081.14	4242.39
Net Revenue	7190.39	-11852.00	5123.61

1977 Base Year

TABLE 11
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Home State : Texas

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	99651.24	176463.00	56274.51
Other Revenue	1021.04	6416.88	162.47
Total Revenue	99814.73	175795.88	56673.57
Fuel Cost	19501.46	36386.08	10451.98
Supplies	9657.80	22283.01	4185.83
Maintenance	17597.80	42364.27	7310.00
Overhead	4168.35	9787.49	1775.24
Interest	5960.05	18326.67	1938.28
Depreciation	6613.45	27120.59	1612.71
Insurance	7499.61	14252.99	3946.13
Total Overhead	6725.24	41429.14	1091.72
Crew Shares	27595.79	77622.16	9810.70
Total Cost	93880.48	161331.23	54630.12
Net Revenue	5934.25	14464.65	2043.45

1977 Base Year

TABLE 12
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Construction : Aluminum Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	2449.24	3316.71	1808.65
Other Revenue	198.25	560.90	70.07
Total Revenue	2726.22	3517.03	2113.23
Fuel Cost	454.27	692.65	297.94
Supplies	203.28	595.20	69.43
Maintenance	550.47	770.48	393.28
Overhead	821.52	10249.04	65.85
Interest[11]	-	-	-
Depreciation	405.46	1880.92	87.40
Insurance	657.35	994.51	434.50
Total Overhead	2086.76	5818.22	748.44
Crew Shares	8.46	341.97	0.21
Total Cost	3744.33	7936.38	1766.55
Net Revenue	-1018.10	-4419.35	346.68

1977 Base Year

[11]One vessel reported interest payments of $800.

TABLE 13
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Construction : Fiberglass Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	85054.81	236214.55	30626.06
Other Revenue[12]	-	-	-
Total Revenue	85088.83	236126.17	30662.03
Fuel Cost	16032.91	48784.97	5269.13
Supplies	7340.83	21231.70	2538.08
Maintenance	18399.18	50768.91	6668.06
Overhead	4030.19	11723.91	1385.41
Interest	8210.62	22918.83	2941.43
Depreciation	12248.31	27061.69	5543.67
Insurance	11596.11	23537.32	5713.04
Total Overhead	7821.37	69704.36	877.62
Crew Shares	25285.47	62240.18	10272.39
Total Cost	83960.67	207386.98	33991.50
Net Revenue	1128.16	28739.19	-3329.46

1977 Base Year

[12] One firm reported other revenue of $551.47.

TABLE 14
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Construction : Reinforced Fiberglass Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	67172.73	79516.26	56745.33
Other Revenue	-	-	-
Total Revenue	67172.73	79516.26	56745.33
Fuel Cost	16251.00	26647.32	9910.75
Supplies	3513.36	4816.60	2562.74
Maintenance	11858.89	39627.23	3548.91
Overhead	1849.03	2440.40	1400.96
Interest	-	-	-
Depreciation	-	-	-
Insurance	3856.58	7002.96	2123.84
Total Overhead	7693.06	8290.64	7138.56
Crew Shares	23747.17	26039.77	21656.41
Total Cost	68053.26	103637.32	44687.05
Net Revenue	-880.53	-24121.06	12058.27

1977 Base Year

TABLE 15
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Construction : Steel Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	115811.99	172420.57	77788.96
Other Revenue	2936.93	6088.56	1416.68
Total Revenue	115852.39	172376.43	77863.18
Fuel Cost	21735.71	36590.89	12911.44
Supplies	11694.28	23813.41	5742.82
Maintenance	20561.62	49079.74	8614.15
Overhead	5436.54	13315.22	2219.71
Interest	6855.86	23073.05	2037.13
Depreciation	7978.55	32371.59	1966.46
Insurance	8179.05	16068.37	4163.26
Total Overhead	9703.50	40426.23	2329.13
Crew Shares	32620.75	75863.59	14026.67
Total Cost	111030.98	160806.28	76662.92
Net Revenue	4821.41	11570.15	1200.26

1977 Base Year

TABLE 16
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1969 to 1992

Construction : Wood Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	64183.26	137014.21	30066.16
Other Revenue	2636.54	15890.45	437.45
Total Revenue	64923.22	135327.47	31146.85
Fuel Cost	12294.83	32507.93	4650.03
Supplies	6350.94	18648.30	2162.90
Maintenance	12577.77	32039.27	4937.70
Overhead	1810.50	5398.49	607.19
Interest	3968.91	11081.48	1421.49
Depreciation	3675.97	13918.53	970.85
Insurance	6230.49	10437.98	3719.02
Total Overhead	2927.33	34279.87	249.98
Crew Shares	18781.62	65160.44	5413.55
Total Cost	59895.75	144732.51	24787.11
Net Revenue	5027.48	-9405.03	6359.74

1977 Base Year

TABLE 17
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Home State : Texas

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	100660.88	203600.79	49767.06
Other Revenue	424.79	1392.82	129.56
Total Revenue	100794.50	202755.33	50107.34
Fuel Cost	18987.90	38717.22	9312.14
Supplies	11161.77	27725.40	4493.53
Maintenance	26590.61	59370.15	11909.36
Overhead	6980.41	19829.73	2457.22
Interest	6157.32	18845.48	2011.76
Depreciation	6534.86	27546.58	1550.26
Insurance	14885.75	27867.46	7951.41
Total Overhead	19558.45	41775.87	9156.79
Crew Shares	24002.87	79830.28	7217.03
Total Cost	110357.25	206316.64	59029.28
Net Revenue	-9562.75	-3561.31	-8921.94

1977 Base Year

TABLE 18
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Vessel Length Class : Less Than 25 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	1977.98	3241.38	1207.02
Other Revenue	198.25	560.90	70.07
Total Revenue	2143.48	3619.87	1269.24
Fuel Cost	300.57	735.57	122.82
Supplies	184.52	453.07	75.15
Maintenance	457.22	725.50	288.14
Overhead	1165.14	10265.55	132.24
Interest	800.00	.	.
Depreciation	405.46	1880.92	87.40
Insurance	716.34	1046.69	490.25
Total Overhead	2170.65	5032.67	936.23
Crew Shares	22.77	842.82	0.62
Total Cost	3648.05	6751.50	1971.16
Net Revenue	-1504.57	-3131.63	-701.91

1977 Base Year

TABLE 19
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Vessel Length Class : Between 25 and 50 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	11245.83	35366.29	3575.97
Other Revenue	752.32	2129.68	265.76
Total Revenue	11411.80	36112.02	3606.26
Fuel Cost	1740.51	3751.54	807.50
Supplies	1950.56	5930.62	641.53
Maintenance	3741.23	10023.51	1396.39
Overhead	916.27	2794.75	300.40
Interest	919.13	1704.11	495.75
Depreciation	2244.08	3522.62	1429.58
Insurance	2586.06	14118.72	473.68
Total Overhead	1644.30	6174.10	437.91
Crew Shares	1010.54	19051.67	53.60
Total Cost	13206.13	29593.44	5893.26
Net Revenue	-1794.34	6518.57	-2287.01

1977 Base Year

TABLE 20
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Vessel Length Class : Greater Than 50 Feet

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	114324.70	158135.92	82651.29
Other Revenue	.	.	.
Total Revenue	114324.70	158135.92	82651.29
Fuel Cost	21784.29	29090.30	16313.17
Supplies	12473.07	25527.20	6094.58
Maintenance	29815.21	52317.92	16991.25
Overhead	7709.71	19430.48	3059.09
Interest	6340.01	19041.08	2111.00
Depreciation	6768.05	28202.96	1624.17
Insurance	16136.41	23696.07	10988.47
Total Overhead	22081.46	35438.36	13758.85
Crew Shares	29223.61	43828.37	19485.54
Total Cost	124342.28	162449.10	95174.44
Net Revenue	-10017.58	-4313.18	-12523.16

1977 Base Year

TABLE 21
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Construction : Aluminum Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	2449.24	3316.71	1808.65
Other Revenue	198.25	560.90	70.07
Total Revenue	2726.22	3517.03	2113.23
Fuel Cost	454.27	692.65	297.94
Supplies	203.28	595.20	69.43
Maintenance	550.47	770.48	393.28
Overhead	821.52	10249.04	65.85
Interest	800.00	.	.
Depreciation	405.46	1880.92	87.40
Insurance	657.35	994.51	434.50
Total Overhead	2086.76	5818.22	748.44
Crew Shares	8.46	341.97	0.21
Total Cost	3744.33	7936.38	1766.55
Net Revenue	-1018.10	-4419.35	346.68

1977 Base Year

TABLE 22
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Construction : Fiberglass Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	87898.08	235930.87	32747.19
Other Revenue	.	.	.
Total Revenue	87898.08	235930.87	32747.19
Fuel Cost	18446.15	49190.75	6917.16
Supplies	9088.02	26338.39	3135.81
Maintenance	18295.97	46020.92	7273.71
Overhead	4604.91	12561.19	1688.15
Interest	8762.14	20492.91	3746.42
Depreciation	13605.57	29278.38	6322.47
Insurance	16311.66	27865.41	9548.41
Total Overhead	23790.07	38233.38	14802.97
Crew Shares	22916.98	62447.43	8410.08
Total Cost	99856.06	196579.53	50723.65
Net Revenue	-11957.98	39351.35	-17976.47

1977 Base Year

TABLE 23
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Construction : Steel Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	117127.47	184865.16	74210.00
Other Revenue	.	.	.
Total Revenue	117127.47	184865.16	74210.00
Fuel Cost	21197.84	32685.69	13747.55
Supplies	12264.97	26783.23	5616.55
Maintenance	33074.99	59043.06	18528.09
Overhead	9821.31	22505.23	4286.03
Interest	6240.52	20709.93	1880.45
Depreciation	6648.04	27681.78	1596.59
Insurance	15819.27	27833.24	8991.02
Total Overhead	21688.74	40798.40	11529.90
Crew Shares	28106.75	74520.41	10600.98
Total Cost	126554.60	195006.67	82130.86
Net Revenue	-9427.13	-10141.50	-7920.86

1977 Base Year

TABLE 24
Average Cost and Returns
in the Gulf of Mexico
Shrimp Fishery
1987 to 1992

Construction : Wood Hull

Cost/Revenue Categories	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	66993.04	131898.37	34026.71
Other Revenue	752.32	2129.68	265.76
Total Revenue	67250.97	131394.75	34420.65
Fuel Cost	13845.74	33518.79	5719.31
Supplies	10651.28	24845.99	4566.12
Maintenance	16554.76	36619.50	7483.99
Overhead	2295.78	5545.62	950.41
Interest	4351.06	9487.80	1995.38
Depreciation	3305.25	15909.98	686.65
Insurance	12481.94	20377.89	7645.49
Total Overhead	10889.52	31299.60	3788.60
Crew Shares	17428.23	37026.94	8203.31
Total Cost	74734.53	151954.36	36756.10
Net Revenue	-7483.56	-20559.61	-2335.45

1977 Base Year

Table 25
Indirect Cost Model
Gulf of Mexico Shrimp Fishery

System Weighted R-Square: 0.7394
Dependent variable: TOTAL COST

Variable	DF	Parameter Estimate	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	3.745449	10.419	0.0001
POUNDS LANDED	1	0.068246	2.426	0.0154
LENGTH	1	0.648408	7.386	0.0001
FUEL PRICE	1	0.043199	2.967	0.0031
AGE	1	-0.222317	-11.861	0.0001
ABUNDANCE	1	-0.079971	-1.801	0.0718
CREW SHARE	1	0.526009	21.094	0.0001

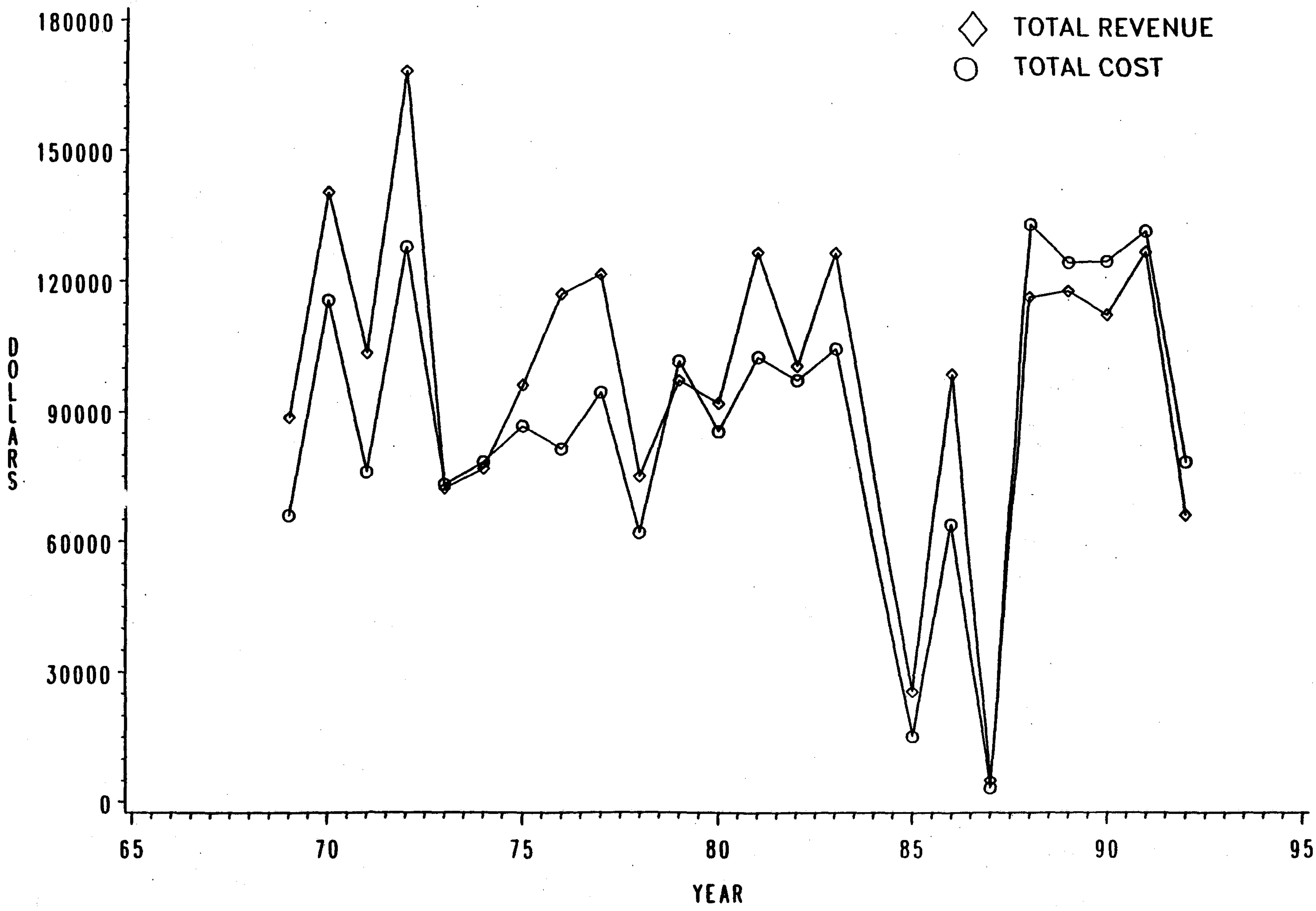
Dependent variable: POUNDS OF SHRIMP LANDED (POUNDS LANDED)

Variable	DF	Parameter Estimate	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	6.946820	15.273	0.0001
SHRIMP PRICE	1	0.034443	1.365	0.1723
COST/POUND	1	-0.962568	-45.524	0.0001
ABUNDANCE	1	-0.197749	-4.766	0.0001
CREW SHARE	1	0.543403	27.244	0.0001
DAYS AT SEA	1	0.136352	1.685	0.0921
AGE	1	-0.208289	-13.383	0.0001

Dependent variable: CREW SHARES

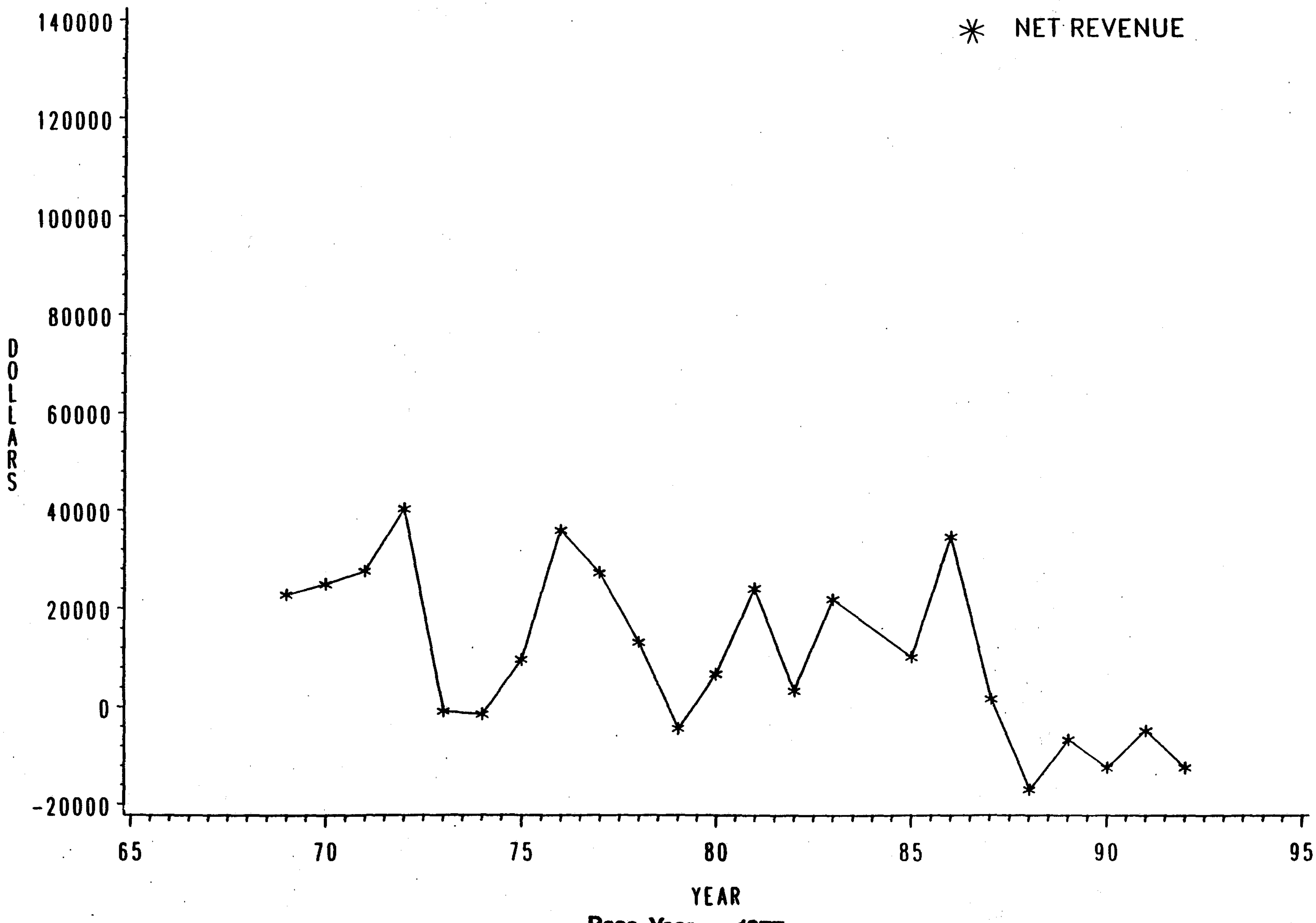
Variable	DF	Parameter Estimate	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	8.410737	82.759	0.0001
SHRIMP PRICE	1	1.248528	17.192	0.0001
FUEL PRICE	1	-0.204516	-4.310	0.0001
SUPPLIES/DAY	1	0.164928	8.252	0.0001
ALUMINUM HULL	1	-4.896462	-13.344	0.0001
ALABAMA	1	0.704383	5.244	0.0001

FIGURE 1
Gulf of Mexico Shrimp Fishery Cost and Returns



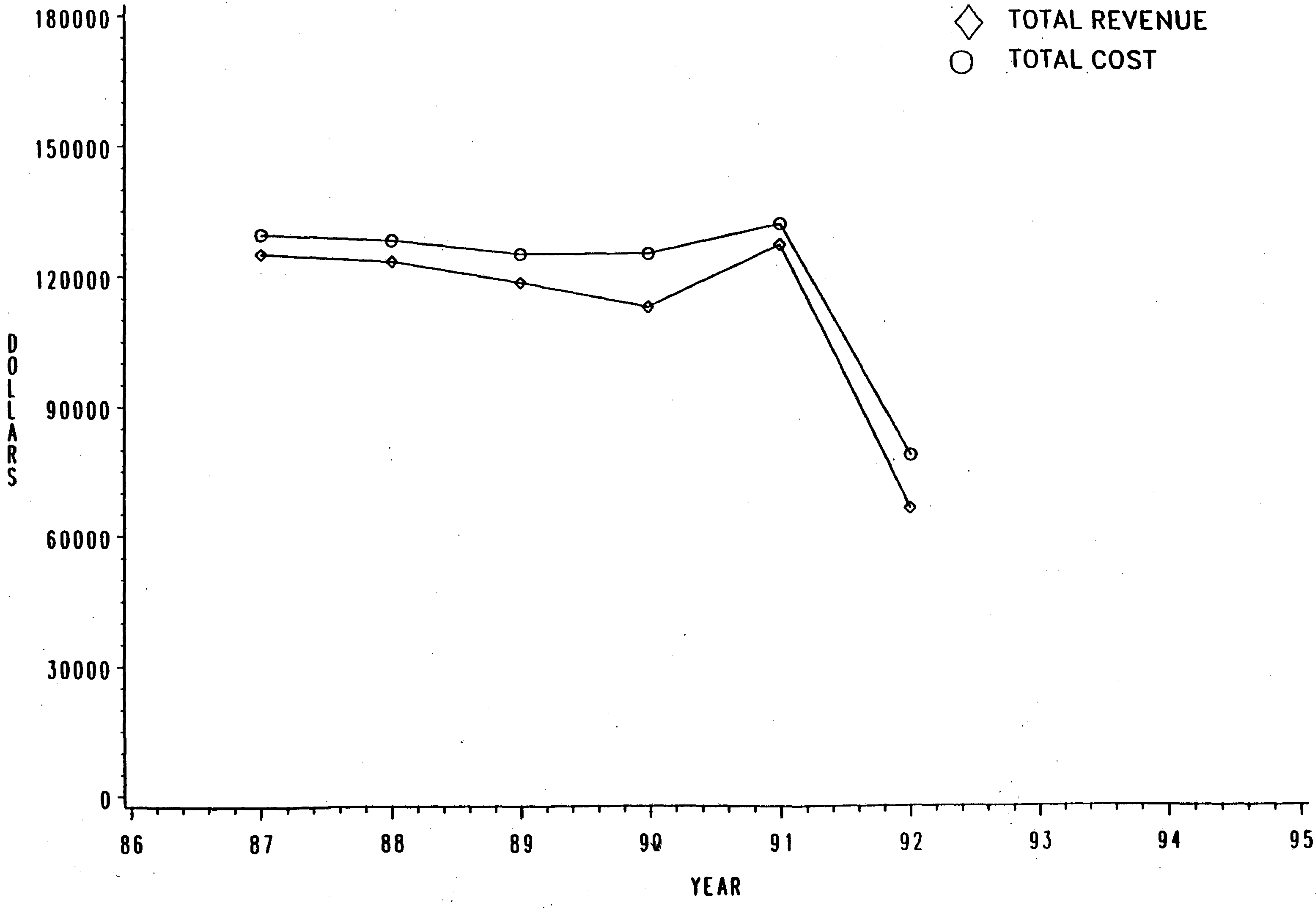
Base Year = 1977

FIGURE 2
Gulf of Mexico Shrimp Fishery Cost and Returns



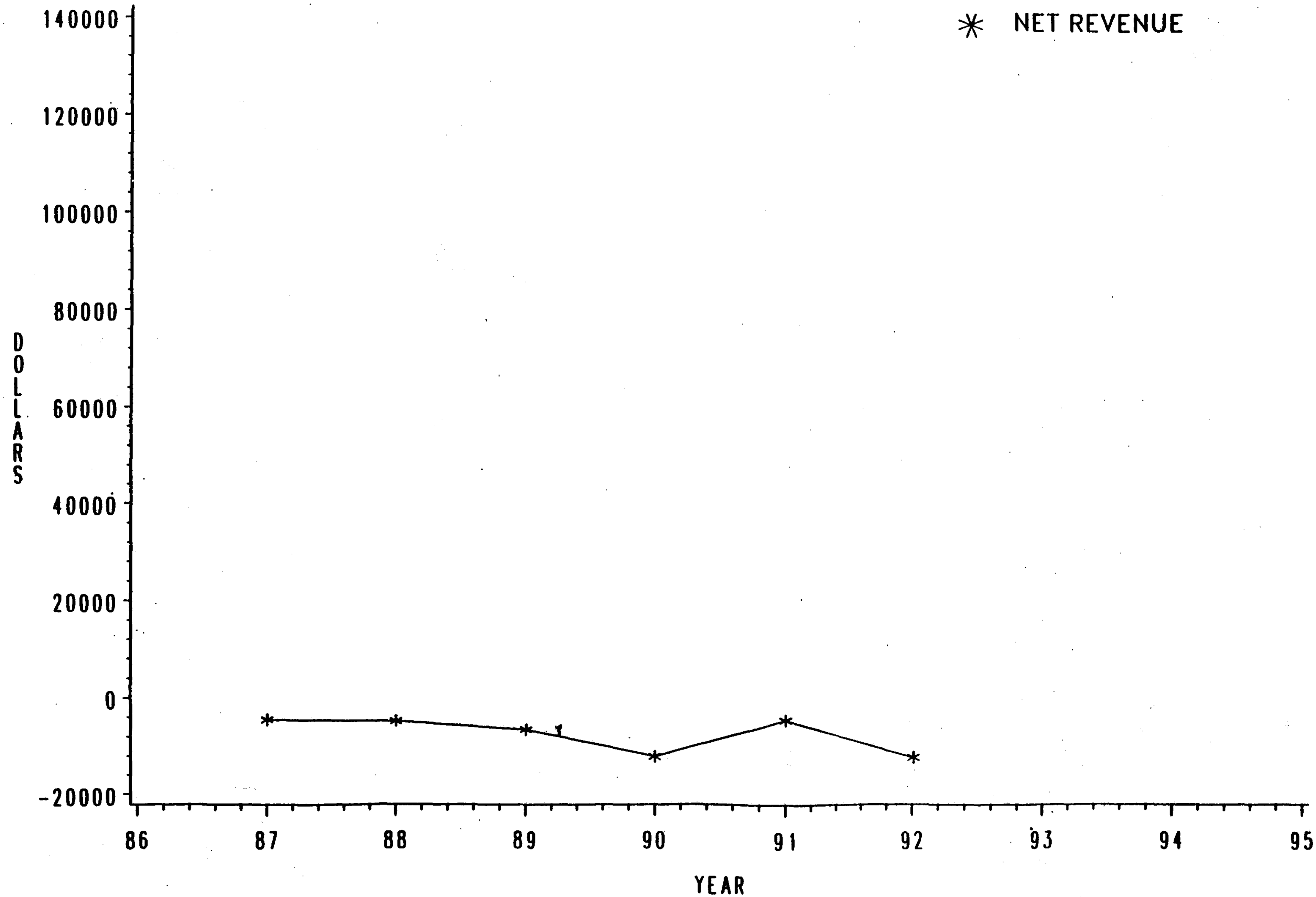
Base Year = 1977

FIGURE 3
Texas Shrimp Fishery Cost and Returns



Base Year = 1977

FIGURE 4
Texas Shrimp Fishery Cost and Returns



Base Year = 1977

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Appendix A

TABLE A1
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Vessel Length Class : Less Than 25 Feet

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	12460.65	109078.46	1423.45
Other Revenue	379.27	1788.09	80.45
Total Revenue	13297.20	112333.93	1574.02
Fuel Cost	1850.65	16586.22	206.49
Supplies	632.52	3833.91	104.35
Maintenance	833.59	2591.82	268.10
Overhead	1165.14	10265.55	132.24
Interest[13]	-	-	-
Depreciation	405.46	1880.92	87.40
Insurance	716.34	1046.69	490.25
Total Overhead	46.59	2935.83	0.74
Crew Shares	741.93	63648.81	8.65
Total Cost	12755.60	56440.00	2882.80
Net Revenue	541.60	55893.93	-1308.78

1977 Base Year

[13]One firm reported interest expense of $800.

TABLE A2
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Vessel Length Class : Between 25 and 50 Feet

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	15617.00	38188.56	6386.48
Other Revenue	869.59	5573.02	135.69
Total Revenue	15973.57	39215.77	6506.44
Fuel Cost	1608.29	3147.90	821.69
Supplies	1486.90	4511.70	490.03
Maintenance	3375.37	8119.44	1403.19
Overhead	956.20	2855.39	320.21
Interest	1021.23	2655.22	392.78
Depreciation	2244.08	3522.62	1429.58
Insurance	2548.28	10818.32	600.25
Total Overhead	52.18	2416.90	1.13
Crew Shares	1182.57	24550.90	56.96
Total Cost	11883.66	24805.91	5693.05
Net Revenue	4089.92	14409.85	813.39

1977 Base Year

TABLE A3
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Vessel Length Class : Greater Than 50 Feet

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	107042.57	158057.98	72493.09
Other Revenue[14]	-	-	-
Total Revenue	107043.48	158060.95	72492.96
Fuel Cost	21402.71	30673.50	14933.94
Supplies	10418.45	21290.01	5098.36
Maintenance	18752.46	41909.76	8390.76
Overhead	4283.46	9724.98	1886.69
Interest	6275.30	18610.89	2115.93
Depreciation	6836.67	27704.78	1687.08
Insurance	7621.23	14050.28	4133.95
Total Overhead	8163.22	31863.82	2091.34
Crew Shares	31134.74	55649.28	17419.31
Total Cost	101444.48	141850.11	72548.29
Net Revenue	5599.00	16210.84	-55.32

1977 Base Year

[14] One firm reported $2,068.97 of revenue from some other source.

TABLE A4
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Construction : Fiberglass Hull

	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Cost/Revenue Categorize			
Shrimp Revenue	100753.37	229994.97	44136.79
Other Revenue	-	-	-
Total Revenue	100753.37	229994.97	44136.79
Fuel Cost	19974.79	46293.03	8618.84
Supplies	8630.71	22036.30	3380.30
Maintenance	20803.49	49349.14	8769.86
Overhead	4646.29	11734.07	1839.77
Interest	8693.29	20183.74	3744.26
Depreciation	13311.97	28618.67	6192.06
Insurance	12692.19	22514.67	7154.96
Total Overhead	10925.01	54438.36	2192.50
Crew Shares	27085.26	63484.74	11555.71
Total Cost	100277.90	182520.39	55093.34
Net Revenue	475.46	47474.58	-10956.55
Length (Feet)	71.25	85.72	59.22
Vessel Age	14.50	16.12	13.04
Vessel Initial Cost	250349.06	408224.53	153529.86

1977 Base Year

TABLE A5
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Construction : Reinforced Fiberglass Hull

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	67172.73	79516.26	56745.33
Other Revenue	-	-	-
Total Revenue	67172.73	79516.26	56745.33
Fuel Cost	16251.00	26647.32	9910.75
Supplies	3513.36	4816.60	2562.74
Maintenance	11858.89	39627.23	3548.91
Overhead	1849.03	2440.40	1400.96
Interest	-	-	-
Depreciation	-	-	-
Insurance	3856.58	7002.96	2123.84
Total Overhead	7693.06	8290.64	7138.56
Crew Shares	23747.17	26039.77	21656.41
Total Cost	68053.26	103637.32	44687.05
Net Revenue	-880.53	-24121.06	12058.27
Length (Feet)	75.00	75.00	75.00
Vessel Age	21.00	21.00	21.00
Vessel Initial Cost	86521.00	86521.00	86521.00

1977 Base Year

TABLE A6
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Construction : Steel Hull

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	116051.25	171547.23	78508.37
Other Revenue[15]	-	-	-
Total Revenue	116053.08	171552.61	78508.38
Fuel Cost	22150.64	31751.27	15452.96
Supplies	12146.73	24213.08	6093.53
Maintenance	19733.81	47025.76	8281.06
Overhead	5660.90	12840.95	2495.60
Interest	6204.46	20326.71	1893.83
Depreciation	6686.05	27178.26	1644.82
Insurance	8112.05	16024.07	4106.66
Total Overhead	9331.12	39342.90	2213.10
Crew Shares	32448.78	70198.75	14999.17
Total Cost	109611.13	156951.48	76549.77
Net Revenue	6441.95	14601.13	1958.61
Length (Feet)	72.32	76.89	68.02
Vessel Age	16.97	26.01	11.07
Vessel Initial Cost	175507.22	294094.26	104737.80

1977 Base Year

[15]One firm reported $2,068.97 of revenue from other sources.

TABLE A7
Average Cost and Returns
in the Texas Shrimp Fishery
1969 to 1992

Construction : Wood Hull

Cost/Revenue Categorize	Average Real Dollars	Plus One Standard Deviation	Minus One Standard Deviation
Shrimp Revenue	73859.32	136807.45	39875.02
Other Revenue	1450.26	9412.94	223.44
Total Revenue	74193.05	136100.94	40445.05
Fuel Cost	14907.08	33314.57	6670.38
Supplies	7808.56	19030.37	3204.02
Maintenance	13914.99	31991.44	6052.47
Overhead	2411.51	4352.71	1336.04
Interest	3889.34	9427.97	1604.48
Depreciation	3701.78	17375.65	788.64
Insurance	6534.43	10232.54	4172.84
Total Overhead	4025.25	39570.01	409.47
Crew Shares	20492.83	64956.70	6465.17
Total Cost	70853.25	136446.49	36792.32
Net Revenue	3339.80	-345.54	3652.72
Length (Feet)	68.73	82.67	57.14
Vessel Age	20.28	28.62	14.38
Vessel Initial Cost	100179.30	192809.17	52050.91

1977 Base Year

Appendix B

Part I: Fuel - Days at Sea
Two-Stage Least Squares Estimation

Model: FUELGAL
Dependent variable: FUELGAL Gallons of Fuel

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	181883969711	36376793942	189.076	0.0001
Error	403	77534091825	192392287.41		
C Total	408	258639615858			

Root MSE	13870.55469	R-Square	0.7011
Dep Mean	35999.97598	Adj R-SQ	0.6974
C.V.	38.52934		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob>|T|
INTERCEP	1	-28225	4438.725870	-6.359	0.0001
LENGTH	1	454.256572	99.833524	4.550	0.0001
DFPT	1	2650.446428	844.994368	3.137	0.0018
ABPLB	1	-3833.611360	1544.399967	-2.482	0.0135
DAYS	1	216.021646	43.169912	5.004	0.0001
WOODHL	1	-10215	1812.182649	-5.637	0.0001

Variable	DF	Variable Label
INTERCEP	1	Intercept
LENGTH	1	Vessel Length
DFPT	1	Days Fished Per Trip
ABPLB	1	Shrimp Price Per Pound
DAYS	1	Number of Days at Sea
WOODHL	1	Wood Vessels

Model: DAYS
Dependent variable: DAYS Number of Days at Sea

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	865649.65112	173129.93022	83.052	0.0001
Error	403	840091.69523	2084.59478		
C Total	408	1820452.4401			

Root MSE	45.65736	R-Square	0.5075
Dep Mean	190.66993	Adj R-SQ	0.5014
C.V.	23.94576		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	76.558886	16.311097	4.694	0.0001
LENGTH	1	0.880977	0.373471	2.359	0.0188
ABPLB	1	10.388555	4.054680	2.562	0.0108
FUELGAL	1	0.000865	0.000353	2.451	0.0147
ALUMHL	1	-89.058596	28.130422	-3.166	0.0017
STLA	1	-24.603480	6.934906	-3.548	0.0004

Variable	DF	Variable Label
INTERCEP	1	Intercept
LENGTH	1	Vessel Length
ABPLB	1	Shrimp Price Per Pound
FUELGAL	1	Gallons of Fuel
ALUMHL	1	Aluminum Vessels
STLA	1	Louisiana Vessels

Part II: Indirect Total Cost Model
Two-Stage Least Squares Estimation

Model: TOTAL COST
Dependent variable: LTOTCOST

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	228.63574	38.10596	286.001	0.0001
Error	1471	195.99215	0.13324		
C Total	1477	352.96099			

Root MSE	0.36502	R-Square	0.5384
Dep Mean	11.47513	Adj R-SQ	0.5366
C.V.	3.18094		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	7.055816	0.648420	10.882	0.0001
LSHRLBS	1	0.040617	0.036658	1.108	0.2681
LLENGTH	1	0.193011	0.181608	1.063	0.2881
LFUELP	1	0.085180	0.022188	3.839	0.0001
LAGE	1	-0.186244	0.025409	-7.330	0.0001
LLBSPDF	1	-0.268505	0.059127	-4.541	0.0001
LSHARES	1	0.528727	0.037992	13.917	0.0001

Variable	DF	Variable Label
INTERCEP	1	Intercept
LSHRLBS	1	Pounds Landed
LLENGTH	1	Vessel Length
LFUELP	1	Fuel Price
LAGE	1	Age of the Vessels
LLBSPDF	1	Abundance in Pounds per Day Fished
LSHARES	1	Crew Shares

Model: POUNDS OF SHRIMP LANDED (POUNDS LANDED)
Dependent variable: LSHRLBS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	176.32069	29.38678	512.379	0.0001
Error	1471	84.36709	0.05735		
C Total	1477	289.03117			

Root MSE	0.23949	R-Square	0.6764
Dep Mean	10.60739	Adj R-SQ	0.6750
C.V.	2.25773		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-0.733658	0.672930	-1.090	0.2758
LSHRPLB	1	-0.122808	0.037495	-3.275	0.0011
LCPLB	1	-0.713130	0.028323	-25.179	0.0001
LLBSPDF	1	0.248605	0.050986	4.876	0.0001
LSHARES	1	0.237545	0.028500	8.335	0.0001
LPDAYS	1	1.578937	0.122745	12.864	0.0001
LAGE	1	-0.136443	0.016409	-8.315	0.0001

Variable	DF	Variable Label
INTERCEP	1	Intercept
LSHRPLB	1	Shrimp Price per Pound
LCPLB	1	Shrimp Harvest Cost per Pound
LLBSPDF	1	Abundance in Pounds per Day Fished
LSHARES	1	Crew Shares
LPDAYS	1	Days at Sea
LAGE	1	Age of Vessel

Model: CREW SHARES
Dependent variable: LSHARES

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	469.66250	93.93250	133.406	0.0001
Error	1472	1036.45181	0.70411		
C Total	1477	1506.11431			

Root MSE	0.83911	R-Square	0.3118
Dep Mean	10.25611	Adj R-SQ	0.3095
C.V.	8.18159		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	8.147652	0.127870	63.718	0.0001
LSHRPLB	1	1.281612	0.082692	15.499	0.0001
LFUELP	1	-0.236294	0.048661	-4.856	0.0001
SUPPLIES/DAY	1	0.223269	0.029711	7.515	0.0001
ALUMHL	1	-6.524566	0.493000	-13.234	0.0001
STAL	1	0.841876	0.219177	3.841	0.0001

Variable	DF	Variable Label
INTERCEP	1	Intercept
LSHRPLB	1	Shrimp Price per Pound
LFUELP	1	Fuel Price
SUPPLIES/DAY	1	Supplies per Day at Sea
ALUMHL	1	Aluminum Hull
STAL	1	Home State: Alabama

Three-Stage Least Squares Estimation

Cross Model Covariance

Sigma	LTOTCOST	LSHRLBS	LSHARES
LTOTCOST	0.1332373532	0.0637544769	-0.198482297
LSHRLBS	0.0637544769	0.0573535619	-0.025005888
LSHARES	-0.198482297	-0.025005888	0.7041112843

Cross Model Correlation

Corr	LTOTCOST	LSHRLBS	LSHARES
LTOTCOST	1	0.7293189386	-0.648019576
LSHRLBS	0.7293189386	1	-0.124434679
LSHARES	-0.648019576	-0.124434679	1

Cross Model Inverse Correlation

Inv Corr	LTOTCOST	LSHRLBS	LSHARES
LTOTCOST	6.5503652684	-4.315937413	3.7077126406
LSHRLBS	-4.315937413	3.859433932	-2.316564512
LSHARES	3.7077126406	-2.316564512	3.1144094137

Cross Model Inverse Covariance

Inv Sigma	LTOTCOST	LSHRLBS	LSHARES
LTOTCOST	49.163129645	-49.37213894	12.105212482
LSHRLBS	-49.37213894	67.291965872	-11.52772345
LSHARES	12.105212482	-11.52772345	4.4231778174

System Weighted MSE: 1.5018 with 4414 degrees of freedom.
System Weighted R-Square: 0.7394

Three-Stage Least Squares Estimation

Model: TOTAL COST
Dependent variable: LTOTCOST

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	3.745449	0.359489	10.419	0.0001
POUNDS LANDED	1	0.068246	0.028136	2.426	0.0154
LENGTH	1	0.648408	0.087790	7.386	0.0001
FUEL PRICE	1	0.043199	0.014562	2.967	0.0031
VESSEL AGE	1	-0.222317	0.018744	-11.861	0.0001
ABUNDANCE	1	-0.079971	0.044392	-1.801	0.0718
CREW SHARES	1	0.526009	0.024937	21.094	0.0001

Model: POUNDS OF SHRIMP LANDED (POUNDS LANDED)
Dependent variable: LSHRLBS

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	6.946820	0.454844	15.273	0.0001
SHRIMP PRICE	1	0.034443	0.025224	1.365	0.1723
COST/POUND	1	-0.962568	0.021144	-45.524	0.0001
ABUNDANCE	1	-0.197749	0.041488	-4.766	0.0001
CREW SHARES	1	0.543403	0.019946	27.244	0.0001
DAYS AT SEA	1	0.136352	0.080903	1.685	0.0921
VESSEL AGE	1	-0.208289	0.015564	-13.383	0.0001

Model: CREW SHARES
Dependent variable: LSHARES

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEPT	1	8.410737	0.101630	82.759	0.0001
SHRIMP PRICE	1	1.248528	0.072623	17.192	0.0001
FUEL PRICE	1	-0.204516	0.047449	-4.310	0.0001
SUPPLIES/DAY	1	0.164928	0.019987	8.252	0.0001
ALUMINUM HULL	1	-4.896462	0.366937	-13.344	0.0001
ALABAMA	1	0.704383	0.134313	5.244	0.0001

Appendix C
Annotated Bibliography of Cost and Return Studies Conducted in the Southeastern Region

Anonymous (undated). "Feasibility Study of Mariscos Del Carmen, S.A. and Pescadores De Mariscos Del Carmen, S.A." A prospectus prepared for a Mexican fishing firm.

A description of the plant, boatyard, and trawlers of a Mexican shrimp fishing firm with a statement of the net worth of the company and potential for future earnings.

Arnold, Vic (196?). "Shrimp." Unpublished working paper.

In this study, vessels from 13 major Gulf of Mexico shrimp ports were surveyed to determine their cost and earning structure. This information was combined with effort data for a sample of vessels spending 50 percent or more of their time on the Tortugas shrimp grounds. Using both these series of data, broken down into vessel size categories and specifying the distribution of landings between three Florida ports, a linear programming model was developed for the expressed purpose of determining the optimal patterns, the distribution of species and the cost components of vessel operations. Using constraints based on various assumptions, results were derived that suggested considerable differences from current port use patterns. Social benefits derived from their application demonstrate the value of this technique.

Binswanger, Hans P. (1974). "A Cost Function Approach to the Measurement of Elasticities of Factor Demand and Elasticities of Substitution." American Journal of Agricultural Economics, 56(2):377-387.

This paper derives the Allen partial elasticity of substitution in terms of the cross derivatives of the cost function. Then, the result is applied to the case of the translog cost function and methods to avoid estimation biases caused by neutral and non-neutral efficiency differences are presented. Finally, the translog method is used to derive estimates of elasticities of derived demand and of elasticities of substitution for the agricultural sector using U.S. cross sectional data of states for the years 1949, 1959, and 1964.

Blomo, Vito J. and Wade L. Griffin (1978). "Costs and Returns Data: Florida-Based Gulf of Mexico Shrimp Trawlers, 1977." TAMU-SG-79-604, Department of Agricultural Economics, Texas Agricultural Experiment Station, Texas A&M University, October, 33 pp.

This report summarizes estimates of costs and returns for vessels of different characteristics that anchor in Florida and trawl in the Gulf of Mexico. Data for the calendar year 1977 were collected from vessel owners. Results are presented in self explanatory tables. No attempt is made to draw inferences or discuss implications of trends, or relationships that may be apparent in the data. The file also contains a June, 1978 draft final report to NMFS.

Boyce, John R. (1993). "Using Participation Data to Estimate Fishing Costs for Commercial Salmon Fisheries in Alaska." Marine Resource Economics, 8(4):367-394.

This paper estimates the fishing costs and the returns to fishing from nine commercial salmon fleets in Alaska. The econometric model uses a two-stage least squares estimation procedure to estimate the effect of congestion and heterogeneity on the returns to fishermen. The hypotheses that fishermen are homogenous and that there is no congestion externality present in the fisheries are strongly rejected. The data indicates that fishermen are quite heterogeneous in fishing skill levels. This difference accounts for the overall estimates of positive net returns to the common property fisheries. Estimates of the net returns to the fisheries suggest that the returns to different gear types vary largely. The set net fleets are found to have the highest return as a percentage of total revenues.

Cato, James C. and Frank J. Lawlor (1981). "Small Boat Longlining For Swordfish on Florida's East Coast: An Economic Analysis." MAP-15, Marine Advisory Bulletin of Florida Sea Grant College in cooperation with the Food and resource Economics Department, University of Florida, Gainesville, FL.

This bulletin contains a method for making a profitability analysis based on cost and returns of a 36 foot swordfish longline vessel on Florida's lower Atlantic coast. In addition, an number of other factors that merit consideration before becoming a fisherman are also discussed. Potential investors who are not experienced in fishing should pay particular attention to the estimated costs and returns statements. Net returns and the return on investment to an absentee owner are often much different than those to a captain/owner. The same techniques can be used in analyzing any fishery.

Cato, James C. and Fred J. Prochaska (1976). "The Gulf of Mexico Commercial and Recreational Red Snapper-Grouper Fishery: An Economic Analysis of Production, Marketing, and Prices." Pages 95-128 in Harvey R. Bullis, Jr. and Albert C. Jones (eds.) "Proceedings: Colloquium on Snapper-Grouper Fishery Resources of the Western Central Atlantic Ocean. Report Number 17, Gulf States Marine Fisheries Commission, New Orleans, Louisiana, Texas A&M

University Sea Grant College and Mississippi-Alabama Sea Grant Consortium, November, 333 pp.

Owners and captains of both commercial red snapper boats and party boats along the north Florida Gulf coast were interviewed in 1975. Cost and return data were collected and analyzed for 1974. Also documented and analyzed was the economic importance to the region of the commercial and party boat industry. Price analyses are conducted and compared with past research. A description of marketing channels is provided with special emphasis placed on the role of imports. Finally, the need for management programs in the red snapper-grouper industry receives comment.

Cato, James C. and Fred J. Prochaska (1977). "A Statistical and Budgetary Economic Analysis of Florida Based Gulf of Mexico Red Snapper-Grouper Vessels by Size and Location, 1974-75." Marine Fisheries Review, 39(11):6-14.

This paper combines the analysis of production data for the northern gulf commercial vessels with additional production data collected from the Florida west coast or southeastern gulf red snapper-grouper production area to provide a comparative report on the costs and returns for vessels operation in these two areas. Two methods of analysis were used to analyze the cost and returns data. First, an ordinary least squares regression equation using dummy variables was used to determine if statistically significant differences exist in costs and revenues between port locations and size of the fishing firm. Second, specific differences in costs and revenues by firm size and port location are analyzed using detailed cost and return budgets for the four classes of vessels.

Centaur Associates Inc. (1985). Commercial Fishing Cost Return Profiles for Gulf Coast Areas. Prepared for Army Corps of Engineers Mobile District, 109 St. Joseph Street, Mobile, Alabama. Under Contract No. DACW01-84-C-0111.

Final report of a shrimp vessel cost and returns survey contract of selected ports in Mississippi and Alabama. Summarized data is provided in the form of tables with some preliminary analysis of wage rates, returns to owner for management, returns to the vessel, daily operating costs, and unit operating costs. Hard copy of the raw data is also included in the file.

Crutchfield, Stephen R. (1986). "Personal Computer Simulations of Two New England Trawl Fisheries." Fisheries Research, 4:157-165.

This paper outlines the basic components of two personal computer based bioeconomic simulators for New England otter trawlers and presents selective results illustrating their use for policy analysis. It has proved difficult to monitor the economic status of commercial fisheries because of technical, bureaucratic

and cost considerations associated with survey procedures, and the difficulty of timely acquisition of biological and harvest data. The author has developed an alternative approach that combines information from various data bases, including periodic surveys, and integrates them in a budgeting or economic engineering approach. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation.

Crutchfield, Stephen R. (1987). "Development and Application of Financial Simulators for the Fishing Industry." Computers and Electronics in Agriculture, 1:309-319.

This paper outlines the basic components of the vessel simulator for otter trawlers and presents selective results illustrating its use for policy analysis. It has proven difficult to monitor economic status of commercial fisheries because of technical, bureaucratic, and cost considerations associated with survey procedures and the difficulty of timely acquisition of biological and harvest data. The author has developed an alternative approach that combines information from various data bases, including periodic surveys, and integrates them in a budgeting or 'economic engineering' approach. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation. As an example the simulation program is used to evaluate the economic performance of the New England otter trawl fishing fleet during the period after the 200 mile limit was imposed. Other applications are suggested for financial advisors and investors.

Clark, Joy and Wade Griffin (1987). "Costs and Returns of Seven Texas Shrimp Vessels." Natural Resources Working Papers Series, Natural Resource Workgroup, Department of Agricultural Economics, Texas A&M University, College Station, Texas 77843.

This report presents summaries of costs and returns information for seven categories of vessels shrimping off the Texas coast. This information can be compared with a vessel of similar type. Trends of revenue, variable costs and pounds landed for these categories are also presented.

Crutchfield, Stephen R. and John M. Gates (198?). "The Impact of Extended Fisheries Jurisdiction on the New England Otter Trawl Fleet." Draft Report, Department of Resource Economics, University of Rhode Island, Kingston, RI.

Prior to the enactment of the Fisheries Conservation and Management Act of 1976, it was widely anticipated that extension of fisheries jurisdiction to 200 miles by the United States would result in substantial economic benefit to the domestic fishing industry. This paper examines the economic consequences of extended jurisdiction on the New England otter trawl fleet. The

traditional analyses of exploited fisheries show that in the absence of controls on entry into the domestic fishery exclusion of foreign fleets will only yield temporary economic surpluses as rents will eventually be dissipated by additional domestic fishing effort. Using a simulation program for this fishery, revenues and costs for representative vessels from four major New England ports from 1976 to 1982 are calculated, and net economic returns to owners, captains, and crew are estimated. For three of the four ports considered, the estimated real economic surplus for the typical vessel peaked in 1977-78 and declined dramatically through 1982. While this result is consistent with rent dissipation through overfishing, other factors indicate that this decline in economic surplus may be due to exogenous factors.

Danvill Research Associates, Inc. (1982). "Work Plan for the Development of Cost, Revenue and Income Profiles for the Gulf and South Atlantic Shrimp Fleets." Contract No. NA82-GA-C-00041, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida 33149, December 1.

A work plan for developing statistically sound data on the operating costs and revenues of the Gulf of Mexico and south Atlantic shrimp fleets.

Duffy, John, Jr. and David B. Johnson (1979). "Study of Costs and Earnings of Bay Shrimp Fishermen in Louisiana." Contract Number 03-7-042-35132, Louisiana State University, Baton Rouge, Louisiana.

This survey was conducted to develop 1977 economic data on the inshore shrimping industry located in the Louisiana parishes of St. Mary, Lafourche, and Terrebonne. Economic information was gathered on mean average landings of shrimp for various boat sizes, as well as mean family size and total family income due to shrimping. Data were also gathered on total variable costs, total fixed costs, and net revenue by vessel size. Other data gathered included information on marketing channels, and subjective appraisals of the problems confronted by recreational and commercial shrimpers. Although much data were obtained, and despite elaborate measures taken to obtain the cooperation of the interviewees, there was considerable reluctance on the part of the shrimpers to reveal catch, income, or even cost data.

Gates, John M. and Stephen R. Crutchfield (1985). "Measuring the Performance of the Fishing Industry Using Financial Simulators." Draft report, Department of Resource Economics, University of Rhode Island, Kingston, RI.

The New England industry has been the focus of much research related to fisheries management and the economic status of fishermen. It has proven difficult to monitor economic status because of technical, bureaucratic and cost considerations associated with survey procedures. The authors have developed an alternative approach that combines information various data bases, including periodic surveys, and integrates them in a budgeting or economic engineering approach. The development of these programs originated on mainframe computers but has since been adapted to personal computers. The result of these adaptations is a tool useful for extension education as well as for research policy evaluation. This paper outlines the basic components of the vessel simulator for otter trawlers and presents selective results illustrating its use for policy analysis. Other applications are suggested for financial advisors and investors.

Griffin, Wade L. (1977). "Time Trends in the Harvesting Sector of the Gulf of Mexico Shrimp Industry." DIR 77-1, SP-2, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, March, 32 pp.

Time trends in pounds landed, days fished, fleet size, fishing effort index numbers, and value are presented and discussed.

Griffin, Wade L. and John P. Nichols (1976). "An Analysis of Increasing Costs to Gulf of Mexico Shrimp Vessel Owners: 1971-75." Marine Fisheries Review, 38(3):8-12.

This report is intended to provide current information on the economics of owning and operating a shrimp vessel in the Gulf of Mexico. Lower shrimp prices coupled with rapidly escalating prices for fuel and other input items have brought about a cost-price squeeze that has put the vessel owners in a struggle for economic survival. Cost and returns estimates are based on 1971 and 1973 data collected from shrimp vessel owners. More specifically, this report includes: 1)Estimated break-even annual shrimp catches with various ex-vessel shrimp prices for 1971, 1973, 1974, and 1975; and 2) Evaluation of expected cost and returns in 1975.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "Installation Manual for Budget Simulation System." In "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual is designed to enable the user to install and test either the Aquaculture Budget Simulation System or the Vessel Budget Simulation System.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "User Manual for Data Management System." Volume 1 in "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-

M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual discusses the mechanics of operating the data management program (DMP) and provides detailed descriptions of the variables to be entered into the direct access (D-A) files.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "User Manual for Budget Simulation System." Volume 2 in "A Generalized Budget Simulation Model for Fishing Vessels." Draft Version 1, Sea Grant No. 04-8-M01-133, Texas A&M University, Department of Agricultural Economics, Texas Agricultural Experiment Station, College Station, Texas.

This manual contains three sections: the general descriptions of the operations of the budget simulator program, a description of each agenda, including operations performed in the called subroutines, and the Appendix tables containing codes for variables, data description and data format information.

Griffin, Wade L., Linda A. Jensen, and Charles M. Adams (1983). "A Generalized Budget Simulation Model for Fishing Vessels." TAMU-SG-83-203, Marine Information Service, Sea Grant College Program, Texas A&M University, College Station, Texas, January, 113 pp.

The Vessel Budget Simulator System (VBSS) enables a user to select and equip a vessel to be operated in any fishing ground normally frequented by U.S. owned vessels. The physical flow of inputs into the production process aboard a vessel is simulated to produce the information required for financial reports. This system consists of two programs; a data management program (DMP) in COBOL that is used to create and update direct access (D-A) physical inventory files and a budget simulation program (BSP) in FORTRAN that performs all operational procedures. Part 1 of the manual describes the use of the DMP while Part 2 describes the use of the BSP.

Griffin, Wade L., Ronald D. Lacewell, and Wayne A. Hayenga (1974). "Estimated Costs, Returns, and Financial Analysis: Gulf of Mexico Shrimp Vessels." Marine Fisheries Review, 36(12):1-4.

This report results from an economic evaluation of shrimp landings in the Gulf of Mexico based on data available from the National Marine Fisheries Service and is intended for financial institutions, shrimp vessel owners, and prospective shrimp vessel owners. The first part of this report indicates costs and returns of shrimp vessels in 1971. The second part is an investment analysis including cash flow and rate of return on a shrimp vessel entering the Gulf shrimping fleet. The last section reflects cost changes in the base 1971 data to account for cost levels experienced in early 1974.

Griffin, Wade L., J. Nichols, and Joe Bob Smith (1975). "Economic Analysis of Returns to Gulf of Mexico Shrimp Vessel Owners for the Period 1971-1975." Dir 75-1, SP-4, The Texas Agricultural Experiment Station, Texas A&M University System, College Station, Texas, July.

This report provides current information on the economics of owning and operating a shrimp vessel in the Gulf of Mexico for the period 1971-1975. The break-even annual shrimp catches with various ex-vessel shrimp prices for 1971, 1973, 1974, and 1975 are estimated and the expected cost and returns in 1975 are evaluated.

Griffin, Wade L., Newton J. Wardlaw, and John P. Nichols (1976). "Economic and Financial Analysis of Increasing Costs in the Gulf Shrimp Fleet." Fishery Bulletin, 74(2):301-309.

The 115 Gulf of Mexico shrimp vessels used in this study were grouped into classes I (larger vessels) through V (smaller vessels) based on their type of construction, length of keel, and index of effort. In 1973, class II vessels were the only vessels able to register a positive return to owner's labor and management, $560; the other four classes registered negative returns. The payback period occurred during the eighth year due to the sale of the vessels in classes II, III, and V, whereas payback did not occur for classes I and IV. A positive rate of return on investment was experienced by the vessels in classes II, III, and V in the amount of 13.21, 2.65, and 2.63%, respectively. The internal rate of return on investment was negative for vessels in classes I and IV.

Input prices increased some 20% from 1973 to 1974 whereas production remained approximately constant and ex-vessel shrimp prices were lower. Thus, none of the classes of vessels would have experienced a break-even cash flow for 1974. Increasing input cost another 10% above the 1974 level, and assuming normal production, the average vessel in class II seems to be operating at a better than a break-even level in 1975 assuming ex-vessel shrimp prices remain constant at 1973 levels. Classes I, III, IV, and V experienced less than break-even cash flows under the same conditions in 1975.

Griffin, Wade L., Newton J. Wardlaw, and John P. Nichols (1976). "Cost and Return Analysis By Selected Vessel Characteristics: Gulf of Mexico Shrimp Fishery, 1971-1975." MP-1253C, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas.

This report is intended to provide current information concerning the economics of owning and operating a shrimp vessel for use by owners, managers, financial institutions and public policy makers.

Griffin, Wade L., Jim Cato, John Gates, and Fred Prochaska (1981). "Socioeconomic Budget Simulator." Final report, Contract No. NA80-GA-C-00011, NMFS, SEFC, Miami, Florida, pp. 269.

This project develops an enterprise budget simulator for commercial fishing vessels using collected cost and earning information on the Gulf shrimp, Florida paying passenger and New England fishing fleets, and compares the predicted results to actual data.

Griffin, Wade L., John P. Nichols, Robert G. Anderson, James E. Buckner, and Charles M. Adams (1978). "Costs and Returns Data: Texas Shrimp Trawlers Gulf of Mexico 1974-1975." TAMU-SG-79-601, Texas A&M University, Sea Grant College Program, September, 97.

This report summarizes estimates of costs and returns for vessels of different characteristics that anchor in Texas and shrimp trawl in the Gulf of Mexico. Data for 1974 and 1975 were obtained from vessel owners. Results are presented in self explanatory tables. No attempt is made to draw inferences or discuss implications of trends or relationships that may be apparent in the data.

Hayenga, Wayne A., Ronald D. Lacewell, and Wade L. Griffin (1974). "An Economic and Financial Analysis of Gulf of Mexico Shrimp Vessels." MP-1138, The Texas A&M University System, Texas Agricultural Extension Service, Texas Agricultural Experiment Station.

This report includes budgeted estimates of variable and fixed costs of landing shrimp, estimated break-even annual shrimp catches with various shrimp prices for the vessel sizes of 53-65 foot and 66 to 72 foot lengths, evaluation of a prospective investment in a shrimp vessel entering the Gulf shrimping fleet, using internal rate of return and payback procedures of investment analysis, and an updated estimated cost level for spring 1974.

Jones, T.M., J.W. Hubbard, and K.J. Roberts (1979). "Productivity and Profitability of South Carolina Shrimp Vessels, 1971-75." Marine Fisheries Review, 41:8-14.

This study uses data from a 45 vessel sample of South Carolina's double rig resident shrimp trawlers to analyze resource productivity and profitability in the fishery from 1971 to 1975. Smaller vessels (<55 feet) were more profitable, and averaged 14 years older than the larger (>55 feet) vessels and had lower operating costs. Placing vessels of both size classes on the same

risk and financing cost basis would result in slightly higher percentage returns, i.e. lower losses, to investment in the larger trawlers than to investment in the smaller trawlers. The opportunity cost analysis indicated that shrimping labor is earning less than its opportunity income, as is new capital investment, but that management (the vessel captains) is earning above what it would in its best alternative. The larger vessels typically possessed about 1.4 times the fishing power of the typical smaller vessels; engine horsepower was the most significant predictor of fishing power. However, multiplication of the vessel fishing power index by the transformed fuel consumption variable showed that the average larger vessel exerted only 15 percent more effort in the fishery than did the typical smaller vessel.

Kurkul, Patricia A. and Stanley D.H. Wang (1988). "Profitability of the U.S. Northeast Fisheries, 1976-1986." Draft report, Analytical Services Branch, Northeast Region, National Marine Fisheries Service, Gloucester, MA, March, 25 pp.

The methodology used to generate profit data and a discussion of profit trends are presented. Some important factors are discussed in relation to profit trends and tentative conclusions are drawn about fleet financial viability over this time period.

Lacewell, Ronald D., Wade L. Griffin, James E. Smith, Wayne A. Hayenga (1974). "Estimated Costs and Returns for Gulf of Mexico Shrimp Vessels: 1971." Departmental Technical Report No. 74-1, The Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, January, 36 pp.

This study is an analysis of expected vessel costs, returns, and economic implications of alternative shrimp price situations. Costs and return estimates were based on 1971 data taken from 29 vessels separated into two classifications: (1) 53 to 65 foot and (2) 66 to 72 foot. Annual landings of shrimp were 41,551 and 56,933 heads-off pounds for small and large vessels, respectively. Total annual variable cost was $30,031 for small vessels and $51,632 for large vessels. Based on an expected 20 year life and 1971 vessel costs, annual fixed cost was $8,144 and $10,421 for small and large vessels, respectively. Gross revenue was $46,800 for smaller vessels based on a price of $1.13 per pound and $69,869 for large vessels based on a price of $1.23 per pound. The resulting net per vessel was $8,625 and $7,816 for small and large vessels, respectively. The investment analysis indicated that the internal rate of return for a small vessel was 24 percent without external financing and 50 percent with normal financing arrangements of an 80 percent loan at 8 percent interest for 6 years. This compares to an internal rate of return for large vessels of 7 percent without financing and 32 percent with the financing arrangement described above.

Montegut, R.S. (1979). "Planning To Buy a Shrimp Boat." Louisiana Cooperative Extension Service Sea Grant Publication LSU-TL-79-005, Louisiana State University, Baton Rouge, La, 11 pp.

The shrimp industry in the Gulf of Mexico is dominated by owner operated shrimp boats. These businessmen are interested in a lifestyle as well as earning a profit. The lifestyle is one not faced by the investor choosing not to operate his shrimp boat. Absentee owners generally experience higher repair and maintenance costs, higher insurance costs and lower shrimp catches. Understanding the situation faced by an absentee owner compared to the experienced owner operator will be helpful in making your investment decisions. Also, there are already a large number of shrimpers competing with expensive boats for a fully utilized supply of shrimp. Thus, the skills and number of your competitors in shrimping must be considered before you invest in the business.

Muse, Ben and Kurt Schelle (1985). "A Fiscal Model for the Southeast Alaska Salmon Drift Gill Net Fishery in 1981." CFEC Report Number 83-3, Commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811, January, pp. 82.

This paper illustrates a methodology for using mail survey data, vessel licensing information, and catch records to derive a model to estimate operating costs and net returns measures in a fishery. Operating costs, net operating income, and returns to labor and management are estimated for the Southeastern Alaska salmon drift gill net fishery.

Muse, Ben and Kurt Schelle (1985). "Net Return Estimates for the Southeast Alaska Salmon Drift Gill Net Fishery, 1980-1982." CFEC Report Number 84-9, commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811, April, pp. 17.

This report summarizes the results of CFEC research into the net returns of Southeast Alaska salmon drift gill net fishermen in 1980, 1981, and 1982. A brief description of the CFEC financial model for this fishery is provided as well as various outputs of that model. Results summarized include estimates of average fleet operating costs for each year and estimates of average net operating income and average returns to labor for the fleet and for various parts of it.

Muse, Ben and Kurt Schelle (1986). "A Fiscal Model for the Cook Inlet Salmon Drift Gill Net Fishery in 1982." Document Number CFEC 85-4, Commercial Fisheries Entry Commission, Pouch KB, Juneau, Alaska 99811.

This report describes a model designed to produce estimates of

Cook Inlet salmon drift gillnetters' net operating incomes and returns to labor and management. In 1982, a good year in this fishery, mean returns to labor and management for owner operators, assuming a 10% opportunity cost of capital, were about $8,801.

Nero and Associates, Inc. (1981). "Cost and Return Survey of Reef Fisheries, Gulf of Mexico and South Atlantic Coasts." Final report, Contract No. NA-80-6A-C-0051, NMFS, SEFC, Miami, FL.

This report presents the results of an economic survey of commercial reef fishing in the South Atlantic and gulf of Mexico regions of the U.S. This contract called for the collection of data with analysis left to the SEFC, NMFS. This report summarizes the survey design and methodology, presents a discussion of the survey data and analytical procedures, and concludes with some observations and recommendations for future consideration.

Nichols, John P., Mary Gerlow, and A. Nelson Swartz (1980). "The Economics of Combination Swordfish Longlining and Shrimp Trawling in the Gulf of Mexico: Investment Requirements and Estimated Costs and Returns." DIR 80-1, SP-9, Staff Paper Series, Departmental Information Report, The Texas Agricultural Experiment Station, Texas A&M University System, College Station, Texas, December, 33 pp.

This report provides estimates of the economic aspects of swordfish longlining particularly as it relates to investment requirements and operating costs. These estimates are developed from interviews with vessel owners and captains who were active in the fishery during the 1979-80 season. Recent pressure on the shrimp trawling industry of Texas have caused shrimpers to consider alternative fishing opportunities. Among these, swordfish longlining was of particular interest in early 1980. The degree of fishing pressure that swordfish stocks can withstand is not known. Caution has been advised regarding rapid expansion of swordfish longlining even though the short run benefits to shrimpers may be favorable.

Noetzel, Bruno G. (1977). "Revenues, Costs, and Returns from Vessel Operation in Major U.S. Fisheries." PB 265 275, National Marine Fisheries Service, Washington, D.C., February, 23 pp.

The proceeds from operation of fishing vessels in selected U.S. fisheries in the Atlantic, Pacific, and Gulf of Mexico are evaluate. The report covers the groundfish fisheries of New England and the entire Pacific coast (including halibut fishing), the Pacific salmon fisheries, the tuna fisheries (albacore and tropical tuna), the shrimp fishery in the Gulf of Mexico, and the crab fisheries in the Northeast Pacific and Bering Sea. These

fisheries accounted for 65% by quantity and 68% by value of total U.S. food fish landings in 1974. A total of 297 vessel years of operation were analyzed. The purpose of the analysis is to provide an insight into the earning capabilities of vessels operated in various U.S. fisheries during a period of time characterized by abruptly mounting prices of fuel and products made of oil derivatives, with a resulting general deterioration of the economic performance in fisheries in the United states and elsewhere.

Poffenberger, John R. (1982). "Economic Status of the Offshore Shrimp Fishery in the Gulf of Mexico." NOAA Technical Memorandum, NMFS-SEFC-99, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Drive, Miami, Florida, March, 18 pp.

The purpose of this report is to present some basic indicators of the offshore shrimp fishery in the Gulf of Mexico on prices, production, and vessel costs and revenue that may provide some insight into the economic status of the fleet during 1991. A secondary purpose of the report is to present a general prognosis for the economic viability of the fishery during 1982.

Poffenberger, John R. (1985). "Operational and Financial Characteristics of Reef-Fish Vessels in the South Atlantic and Gulf of Mexico Areas." North American Journal of Fisheries Management, 5:379-388.

Cost and revenue data collected from reef fish fishermen in the southeastern United States provided a comprehensive financial and operational profile of commercial fishing vessels during 1980-1981. Analysis of variance test showed that significant differences existed between vessels operated in the south Atlantic areas versus vessels operated in the eastern Gulf of Mexico, although the financial characteristics of these vessels were not significantly different. On the contrary, the financial characteristics of vessels using bottom longlines were significantly different than vessels equipped with the traditional handline fishing gear. Owner operated vessels also had significantly better financial performance than firm operated vessels. Returns to labor, management, and owner's equity showed considerably larger returns for longline equipped and owner operated vessels compared to handline equipped and firm operated vessels. The former two groups of vessels also were comparatively more efficient based on three measures of vessel efficiency. Lastly, risk analyses were performed for several operational and financial characteristics of these vessels, and they showed little or no difference in risk between vessels equipped with longlines compared to vessels using handlines. Comparisons of risk, however, did indicate that owner operated vessels were operated less conservatively than vessels operated by nonowners. Errors in data collection, inappropriate use of statistical procedures, and understanding the concept of risk abound in this analysis.

Prochaska, Fred J. and James C. Cato (1975). "Cost and Returns for Northern Gulf of Mexico Commercial Red Snapper - Grouper Vessels by Vessel Size, 1974." SUSF-SG-75-006, Marine Advisory Bulletin, Department of Food and Resource Economics, Florida Agricultural Experiment Station, Florida Sea Grant Program, University of Florida, Gainesville, FL, December, 8 pp.

Cost and returns data provide a basis to which individual fishing firms can compare their own operations to determine any needed change in their business management or fishing practices. This data set is collected from interviews with boat owners and captains representing ten commercial vessels operating from Florida ports. The budget analysis reported is the average for two vessel size groups: 42-47 feet in length (small) and 57-69 feet in length (large).

Prochaska, Fred J. and Walter R. Keithly, Jr. (1986). "Production Costs and Revenues in the Florida Oyster Industry." Sea Grant Project No. R/LR-E-8, Grant Number NA80AA-D-00038, Report Number 87, Florida Sea Grant College, Sea Grant Extension Program, University of Florida, Gainesville, FL, July, 16 pp.

The purpose of this study was to collect information concerning the production practices and associated costs and revenues of the oystermen in Franklin County for the year starting September, 1982 and ending in August, 1983. A total of twenty-five questionnaires were completed through personal interviews.

Prochaska, Fred J. and Paul D. Landrum (1981). "Spiny Lobster, Stone Crab and Secondary Fishery Costs and Revenues in the Florida Keys, 1978-79 Season." Florida Sea Grant College, Report Number 42, University of Florida, Gainesville, FL, May, 35 pp.

The objective of study was to analyze production, costs and revenues for the multiple species fisheries in which spiny lobster fishermen in the Florida Keys participate. Results of the analyses provide (1) individual fishermen a base with which they can compare their own lobster operations to determine if any changes in their fishing practices were warranted, (2) analysis of the profitability of fishery alternatives to lobster fishing, (3) an economic base on which alternative fishery management programs can be analyzed, and (4) economic information to support industries such as credit institutions, boat builders, etc.

Prochaska, Fred J. and Joel S. Williams (1976). "Economic Analysis of Cost and Returns in the Spiny Lobster Fishery by Boat and Vessel Size." Florida Sea Grant Publication,

SUSF-SG-76-004, University of Florida, Gainesville, Fl, July, 18 pp.

An economic survey of 25 Florida Keys lobster boat and vessel captains was conducted during the fall of 1974 to obtain cost, production, and returns data for the 1973-74 season. This study provides (1) individual fishing firms a base with which they can compare their own operations to determine if any change in their fishing practices is warranted, (2) economic information on sales and purchases that may be used as an indication of the economic contribution made by the lobster fishery to the area economy, and (3) and economic basis for determining the economic consequences of alternative management programs that might be considered by the industry and regulatory agencies. To accomplish these objectives, production practices and costs and returns are analyzed on an industry average basis and by four boat and vessel size classes. This bulletin reports on information pertaining to the first objective of the overall study.

Raizin, Myles (1989). "Available Data from the 1986 King Mackerel Economic Costs and Returns Survey." NOAA Technical Memorandum NMFS-SEFC-228, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, June, 11 pp.

Cost and revenue data for vessels operating in the 1986 king mackerel fishery was assembled in response to a request from the Gulf of Mexico Fishery Management Council. The data set is described and summarized profiles are presented.

Resource Economics Consultants (1994). "Estimation of Gulf of Mexico Shrimp Fishing Costs and Returns." Final report prepared for U.S. Department of Commerce, NOAA, National Marine Fisheries Service, 9450 Koger Boulevard, St. Petersburg, FL by Resource Economics Consultants, 108 Mile Drive, College Station, TX, May.

The overall objective of the project was to estimate Gulf of Mexico shrimp fishing craft costs and returns for use in assessing the impacts of fishery management regulations. The final contract report is attached to Ward, J.M. (1994) "Economic Analysis of Finfish Bycatch in the Gulf of Mexico Shrimp Fishery."

Roberts, Kenneth J. and M. E. Sass (1979). "Financial Aspects of Louisiana Shrimp Vessels, 1978." Sea Grant Publication No. LSU-TL-79-007, Center for Wetland Resources, Louisiana State University, Baton Rouge, LA, December, 9 pp.

The excellent shrimp harvests of 1977 and 1978 have brought increased interest in shrimp vessels as investment opportunities.

Adding to investor interest in 1978 were the favorable price and record dockside value of shrimp (the previous record value was exceeded by 16 percent). Shrimpers and other investors will respond to the record earnings by constructing new vessels. Financial incentives such as the Capital Construction Fund (CCF) and the sheltering of capital gains from vessel appreciation also attract investment. The CCF and capital gains incentives are long term, but the shrimp harvests vary from year to year. The result is that investment in the form of vessels drawn into the fishery due to tax incentives will negatively impact earnings per vessel when catches and prices return to normal. This may result in stress on the credit system and shrimp management alternatives, as well as bring about public assistance to help an ailing industry. Based on a survey of 129 operators, shrimp vessels harvested the same quantity of shrimp in 1978 as they did in the record year of 1977 with 1978 prices higher than 1977, resulting in an above average financial condition for shrimp vessels. The financial condition of shrimp vessels in 1978 may be hard to improve on as shrimp catches retreat from record levels, more vessels begin shrimping, and costs continue to increase.

Richardson, Edward J. (1994). "Wreckfish Economic and Resource Information Collection with Analysis for Management." E.J. Richardson Associates, Economic and Market Research for the Fishing, Aquaculture, and Natural Resource Industries, P.O. Box 236, Sandown, New Hampshire, March, 84 pp.

A study was made of the economics of wreckfish harvesting during the transition to a transferable harvesting rights based (ITQ) fishery management program. The goal of the study was to establish a data baseline that could serve as a foundation for subsequent monitoring and assessment efforts. Vessel costs and returns data was assembled for thirty seven vessels, seventeen of which provided 99.9 percent of wreckfish landings during the initial year of rights based management. The data collection allowed for the measurement of the economic values generated by the harvesting sector during the transition to ITQ management, and an evaluation of the initial functioning of the markets for harvesting rights.

Sage Associates, Inc. (1981). <u>Economic Assessment of the U.S. Shrimp Industry with Associated Public Policy Recommendations</u>. Washington, D.C.

This report contests the overcapitalization argument for the Gulf of Mexico and south Atlantic shrimp fishing fleet. It argues that a tariff and quota on shrimp imports would be economically efficient and have little impact on retail shrimp prices.

Schaefer, H. Charles, Lyman E. Barger, and Herman E. Kumpf (1989). "The Driftnet Fishery in the Fort Pierce-Port

Salerno Area off Southeast Florida." Marine Fisheries Review, 51(1):44-49.

From May through September 1987, observations were made on 38 trips in the driftnet fishery off the Fort Pierce-Port Salerno area off southeast Florida. Of the number and weight of fish landed on observed trips, 91.6 percent consisted of king mackerel, *Scomberomorus cavalla*, the targeted species. Over 33 species of fish were observed among the discarded bycatch. The most frequently occurring species in the discards was little tunny, *Euthynnus alletteratus*, that made up 67 percent by number of the discarded bycatch. Total landings for all commercial gear from Saint Lucie and Martin counties (the counties of the study area) increased 516,741 pounds from 1986 to 1987. In 1986, 55 percent of the catch was from handline and 45 percent from driftnet landings. In 1987, 78 percent was from driftnet and 22 percent from handline landings. A comparison of lengths from recreational and commercial landings showed recreationally caught fish to be, on the average, smaller. No marine mammals, birds, or turtles were entangled in the net on observed trips. Data on cost of nets, fuel, and supplies plus the distribution of earnings among the crew were obtained for five driftnet boats.

Swartz, A. Nelson and Charles M. Adams (1979). "The Economics of Rockport Bay Texas Shrimping Vessels." Report, DIR 79-1, SP-6 Department of Agricultural Economics, Texas A&M University, August, 10 pp.

A cost and returns survey of Rockport, Texas shrimp fishermen that takes into account seasonal variation in abundance. The fall season is much more valuable to the shrimp fisherman than the spring season. However, a bay vessel operator could not economically survive in the long run without the spring season.

Taylor, Keri H., Fred J. Prochaska, and James C. Cato (1982). "Economic Returns in Operating Florida Atlantic Coast Charter and Party Boats, 1980-81." Sea Grant Project No. R/L-1, Grant No. NA80AA-D-00038, Marine Advisory Bulletin MAP-28, Florida Sea Grant College Program, August, 15 pp.

This bulletin attempts to provide individual charter boat and party boat owners/captains with basic economic information with which they can compare their own operations and compare the economic characteristics of the charter boat industry on the north and south Florida Atlantic coasts. This has been accomplished by providing a description of the general characteristics of charter boats and party boats in the fleet, an analysis of fishing activity and costs and returns, and a comparison of the differences in charter boat operations between north and south Florida.

Veal, C. David and John R. Kelly (1983). "Fuel Conservation in the Gulf and South Atlantic Shrimp Fishing Fleet."

Report VIII in Assessment of Shrimp Industry Potentials and Conflicts, Shrimp Notes Incorporated, 417 Eliza Street, New Orleans, Louisiana, August, 62 pp.

The problems associated with improving fuel efficiency in the Gulf and south Atlantic shrimp fishing fleet are complex. While the technology exists, the data necessary to do an adequate job of designing fuel efficient technologies for each vessel do not exist since they were not constructed in shipyards using marine engineers or naval architects. The authors propose the formation of a number of task forces and delivery mechanism that should provide adequate information to allow each individual vessel owner to make appropriate decision on fuel saving technologies that affect him.

Veal, David, Ron Lukens, and Dave Burrange (1984). "Structure, Strategy and Fuel Consumption in the Mississippi Alabama Shrimp Fleet." Final report, NMFS Award No. NA82-GA-H-00007, GASAFDFI Project No. 21-04-15000, January, 27 pp.

This study develops a base of information on present fuel use patterns and gear characteristics in the Mississippi and Alabama shrimp fleets as examples of operations that demand high mobility and are fuel intensive. The information can be used in planning fuel use patterns that may be more efficient and in the evaluation of potential needs for research and fuel conservation technology.

Wahyuhadi, Joe (198?). "Factors Influencing Used Fishing Vessel's Prices." REN 591 Special Project, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island.

This paper determined that vessel age, hull type, and length affect the minimum price set by the owner using regression analysis of data collected from boats-for-sale advertisements.

Wang, Stanley (1988). "Chart and Statistical Book of the U.S. Northeast Fisheries." National Marine Fisheries Service, Northeast Regional Office, Services Division, Analytical Services Branch, Gloucester, MA, February, 52 pp.

Trends in investment, landings, biological abundance, productivity, and costs and earnings are emphasized for northeastern region fisheries of the U.S.

Ward, John M. (1984). "A Synthesis of Cost and Revenue Surveys for Vessels Operating in the Gulf of Mexico Shrimp Fishery." Draft Report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL, May, 22 pp.

Hedonic cost and revenue functions are estimated for the Gulf of Mexico shrimp fishery using data published in annual surveys of the fleet from 1971 to 1980. Comparable costs, revenues, and profits are estimated for three vessel size classes for the Texas, Louisiana, and Florida inshore and offshore fleets. The cost and revenue estimates indicate that fishing firms have generally been profitable over the time period of the analysis, exclusive of opportunity costs.

Ward, John M. (1988). "A Synthesis of Cost and Revenue Surveys for Gulf of Mexico Shrimp Vessels." Marine Fisheries Review, 50(1):47-52.

Since detailed cost data are not routinely collected and the published survey data from various sources are not easily compared, trends in costs and revenues for the Gulf of Mexico shrimp fishing fleet cannot be readily determined. A consistent data set for comparing vessel operating costs and revenues between states, vessel sizes, and years was estimated using weighted least squares regression analysis. Differences in the sample variance between the published cost and revenue data caused by time, type of survey, region surveyed, vessel size, sample size, or area of operation are accounted for in the econometric model. The coefficient of determination adjusted for the degrees of freedom and the F statistic indicate that the model specification provides a good statistical fit to the survey data.

Ward, John M. and James M. Nance (1994). "1994 Update to the Stock Assessment and Fishery Evaluation (SAFE) Report for the Gulf of Mexico Shrimp Fishery." National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Drive, North, St. Petersburg, FL.

A comprehensive review of the available economic and biological data for the Gulf of Mexico shrimp fishery. Trends in vessel level operating costs, total revenue, landings, and net revenue are provided over time. Net revenue per vessel is declining with the increase in operating costs and the decline in ex-vessel prices.

Ward, John M. and Jon G. Sutinen (1992). "Modeling Vessel Mobility: The Gulf of Mexico Shrimp Fleet." NOAA Technical Report, National Marine Laboratory, F/AKC3, National Marine Fisheries Service, NOAA, 7600 Sand Point Way, N.E., Seattle, WA 98115-0070.

Given the heterogeneous nature of the fishing fleet and the complex behavior of vessels, the traditional marginalist supply models are not well suited for modeling vessel mobility. A discrete choice model is utilized in this analysis to predict the probability that a vessel will enter, exit, or remain in the Gulf of Mexico shrimp fishery based on a myopic profit maximization criteria. The multinomial logit model indicates that stock variability does not influence fisherman behavior in the Gulf of Mexico shrimp fishery. The crowding externality, represented by the size of the fishing fleet, exhibits a strong negative impact on the probability of entry by fishing vessels independent of changes in abundance, ex-vessel prices, or harvesting costs. Lastly, the Gulf of Mexico shrimp fishery is not the autonomous system of fishing vessels as was initially believed.

Wardlaw, N.J. and Wade L. Griffin (1974). "Economic Analysis of Costs and Returns for Gulf of Mexico Shrimp Vessels: 1973." Departmental Technical Report No. 74-3, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas, December, 43 pp.

A budget generating computer program was established to assimilate and report the data according to the desired vessel classifications, interest rate, percent financed, number of years financed, number of loan payments per year, depreciation method, crew share agreement, rate of packing charges, payroll tax rate, discount rate, planning horizon, and object year under consideration. The program reported results in the form of total costs and returns budgets, unit costs and returns budgets, and projected cash flow budgets.

Warren, John P. and Wade L. Griffin (1978). "Costs and Returns Trends for Gulf of Mexico Shrimp Vessels." DIR 78-1, SP-4, Department of Agricultural Economics, Texas A&M University, College Station, Texas, September, 20 pp.

The profitability of Gulf shrimp vessels in recent years has been highly variable, due largely to changes in input costs, shrimp prices, landings, and the cost, financing terms, and configuration of vessels. Ownership of a Gulf shrimp vessel can be a satisfactory investment given the variation in landings over an extended period of time.

Warren, John P. and Wade L. Griffin (1980). "Costs and Returns Trends in the Gulf of Mexico Shrimp Industry, 1971-78." Marine Fisheries Review, (February): 1-7.

This report describes the magnitude and past performance of the Gulf of Mexico shrimp industry, the recent performance of an "average" Gulf shrimp vessel in terms of costs, returns, and basic investment analysis, summarizes data and analyses and, finally, discusses implications.

Waters, James R. and James M. Nance (1990). "A Description of Trip Data Collected from the 1987 Inshore Shrimp Fishery of Galveston Bay, Texas." NOAA, Technical Memorandum NMFS-SEFC-257, 63 pp.

Economic information about inshore shrimping trips in Galveston Bay, Texas was collected from fishermen at dockside between May 20 and October 30, 1987. This study presents information about fishing effort, operating costs, landings and revenues per trip for trips with bay and bait licenses in Galveston Bay.